THE

AMERICAN REVIEW OF TUBERCULOSIS

ABSTRACTS OF TUBERCULOSIS

VOLUME XII NOVEMBER, 1925 ABST. No. 3

X-ray Appearance of Tuberculous Joints.—The channel of infection of these parts is through the blood-stream. The primary focus may be in the bone or the synovial membrane, the former being more common in children. In diagnosis, clinical and laboratory findings should be considered in conjunction with the roentgenograms. *Primary bony origin:* A circumvascular area of necrosis occurs in the marrow near the epiphyseal line; this may spread with the formation of granulation tissue peripherally. The focus may then shrink and the central deposit become calcified, or caries or absorption with caseation of the bone may occur. Lack of absorption following caseation results in sequestrum formation. In the roentgenogram nothing abnormal is seen until the nutrition of the trabeculae is interfered with, causing rarefaction. The granulations then give a worm-eaten and indistinct appearance to the bony structure. Progressive disease causes an increase of the size and translucency of the rarefied area, its structure becoming hazy as caseation occurs, and later clearer and devoid of structure if an abscess develops. A sequestrum appears as a lighter area on the negative, lying loose in this cavity. Farther out, a reactive sclerotic osteitis may occur, showing then on the negative as a denser white area around the focus. Subperiosteal new bone formation may also occur. As the granulations spread within the shaft, especially toward the joint, the epiphyseal line becomes irregular from absorption of the lime salts. A serous effusion may now form in the joint, and, following perforation, the disease affects the serous membranes and other bones of the joint. In the roentgenogram the joint cavity now appears distended and denser than normal. The further appearance depends on the amount of destruction of the bones and cartilages, and later on the form of ankylosis which takes place. Abscess formation usually results in perforation of the joint capsule toward the surface. *Primary synovial origin:* The tubercle commences in or around a small blood vessel in one of the folds of the synovial membrane, and remains localized or affects the whole joint, resulting in "white swelling." With active disease the articular cartilages are eroded, and the marrow of the shaft is attacked, further progress being much the same as in cases of primary bony origin. At first the roentgenogram is negative, but it soon shows rarefaction of the bones, distension and increased density of the joint cavity, and irregular and gouged-out outlines of the articular bony margins. After the bones are infected the appearances are similar to those of primary bone cases. A healed joint may also show bony ankylosis if the cartilage is destroyed. With healing, much of the rarefaction is lost and bony trabeculae become clearer, but bony deformity is usually left.—*The X-ray Appearances of Tuberculous Joints, R. W. A. Salmond, Tubercle, December, 1924, vi, 123.*—(*J. B. A.*)

Tuberculosis and Osteomyelitis—Chronic osteomyelitis may easily be confused with osseous or articular tuberculosis. Occasionally the two conditions may coexist, when the case may terminate in generalized tuberculosis or rapidly progressive pulmonary tuberculosis. Three cases are reported. In the first there was a tuberculous osteoarthritis of the right foot and an osteomyelitis of the left femur. The patient did badly, and died with signs of pulmonary softening. In the second case, the young woman had a staphylococcus abscess of the forearm. She also had a painful tibio-tarsal osteoarthritis which was not helped by immobilization.

Curettage of the astragalus relieved the pain, and the wound granulated satisfactorily. Fever continued, however, and signs of pulmonary softening developed, resulting in death: tubercle bacilli were found in the sputum. Histological examination showed no definite tuberculosis in the inflammatory osseous lesion. In the third case, that of a young girl, there was a tuberculous abscess of the hip joint and an osteomyelitis of the femur. Death was caused by tuberculous meningitis. There are three possible explanations of such cases: 1. The tuberculosis may give rise to more typical osteomyelitic lesions, while the staphylococcus may localize independently at other places. 2. The staphylococcus infection may be responsible for the cachexia and for the pulmonary manifestations; and then the sputum may show tubercle bacilli. 3. The tuberculous and nontuberculous lesions may develop simultaneously. The presence of streptococci and microörganisms of the pyocyaneus type may practically neutralize the effects of the tubercle bacillus, but the association of the staphylococcus and the tubercle bacillus is sometimes of very serious significance. Such cases as these reported above are rare.—*Tuberculose et ostéomyélite, Silhol, Meeting, Soc. de Chirurgie de Marseille, December, 1924, reported in Presse Méd., January 14, 1925, no. 4, 57.*—(*J. B. A.*)

Treatment of Lupus.—Wirz describes the treatment of 60 cases of lupus by different methods. In 14 cases the lesion was excised surgically; 5 were rayed by the method of Rost; 21 were treated by secondary X-ray, following iodine infiltration of the lesion; 12 were treated by krysolgan iontophoresis; and 5 were handled with general hygienic measures only. Surgical excision gave the best results. However, surgical excision is not always feasible. For general practice some form of ambulant treatment is desirable. Next to surgical excision the iodine-infiltration method, followed by the X-ray and the kyrosolgan iontophoresis method, is best. In the first of these the iodine may be rubbed in with gentle massage, but better results occur on iontophoresis for 20 minutes. Following the iodine infiltration the lesion is X-rayed. A secondary X-ray effect results from the presence of the iodine. From eight to fourteen days after the treatment ulceration of the nodules occurs, followed by scar tissue growth. The cosmetic effect of the scar resulting by this method is not bad. Two X-ray treatments are given, three to four weeks apart, and three months later the procedure is repeated. Sun treatment is given at weekly intervals. Of the 21 cases so treated 6 were completely cured, 5 were rendered stationary, 4 were improved and the rest not definitely helped. By the method of krysolgan iontophoresis slightly better results were obtained. The procedure for this method is as follows: A 0.5 per cent solution of krysolgan, which moves out from the cathode on electrolysis, is applied to an electrode and the current allowed to flow out into the lesion for ten to fifteen minutes. This treatment is repeated twice a week and combined with semiweekly sun treatment. The course is less stormy than with the iodine-X-ray method. Exudative processes are less in evidence. Inflammation tends to subside, and a gradual transformation into normal skin occurs. Ulceration does not take place. Of the 12 cases treated by this method 4 were completely cured and the rest improved.—*Ambulante Lupustherapie, F. Wirz, München. med. Wchnschr., January 2, 1925, lxxii, 10.*—(*E. R. L.*)

Allergy in Tuberculosis of the Skin.—In benign lupus or scrofuloderma and in that of long duration or occurring in later life, the skin allergy approaches the condition of negative phase; in *lupus vulgaris disseminata* skin allergy is slight, and with tuberculides it is strong. In benign, long-existing, or that occurring in old age, lupus and scrofuloderma, there occur strong focal reactions. In mild lupus and scrofuloderma and in most of the *lupus vulgaris disseminata* cases, the skin allergy is weaker than the focal allergy. In most of the cases with tuberculides the skin and focal reactions agree, or else the skin allergy is stronger than the focal allergy.—*Allergiestudien bei Hauttuberkulose, S. Somogyi, Beitr. z. Klin. d. Tuberk., 1923, lvii, 143.*—(*H. J. C.*)

Treatment of Lupus by Methylic Antigen.—The experimental work of Nègre and Boquet, pursued for some years at Calmette's laboratory at the Institut Pasteur has led, among other things, to the following conclusions: 1. That the tubercle-bacillus lipoids, which are soluble in methyl alcohol and insoluble in acetone, have antigenic properties, they deviate complement *in vitro*, and *in vivo* produce substances in the rabbit which behave like antibodies. 2. That they have the property of slowing the march of experimental tuberculous infection in both rabbit and guinea pig, whether the route of introduction be intraperitoneal, intravenous, or subcutaneous. 3. That their administration in the tuberculous rabbit and guinea pig provokes no manifestation of hypersensitiveness. These facts have suggested the trial of these methylic extracts in natural human tuberculosis, especially cu-

taneous, in which one can easily follow the course of the lesions. *Technique:* An aqueous emulsion is made of the methylic extract of tubercle bacilli, treated by acetone and prepared by the method of Nègre and Boquet. The alcohol is removed by distillation in a vacuum; 1 cc. of this emulsion corresponds to 1 cgm. of dried microbic bodies and 5 cgm. of fresh bacilli. Intramuscular injection is preferable to subcutaneous, because of the occasional occurrence of a slightly painful inflammatory reaction. The interscapular region is the favorite site for injection. Two intramuscular injections of the pure extract are given weekly, the initial dose being 0.25 cc. and increases to 0.05 cc., 1 cc., 2 cc., and 4 cc. Generally a favorable result is apparent after 20 injections. They are then omitted for a month, and a new course is then given. The treatment is generally well borne, although occasionally 1 to 2 cc. of the pure extract cause local pain and elevated temperature. These patients received no other form of therapy. They were long-standing cases with extensive lesions. Five typical case reports are cited. *Conclusions:* Antigenic therapy acts favorably in certain cases of cutaneous tuberculosis, especially long-standing cases with an ulcerating or vegetating tendency. There was also a remarkably favorable effect on the general condition. This form of therapy should be differentiated from the tuberculin therapy introduced by Koch and likewise from vaccine therapy. The substances used are the phospholipoids, insoluble in acetone but soluble in methyl alcohol, and endowed with strong antigenic power but deprived of toxicity. The inert fatty or waxy constituents are removed by acetone and the phospholipoids are then extracted by alcohol, rejecting the protein residue. The methylic antigen is obtainable from Calmette's laboratory.—*Traitement du lupus par l'antigène méthylique de A. Boquet et L. Nègre, (Contribution à l'étude thérapeutique par voie interne des tuberculoses humaines de la peau et des muqueuses du lupus en particulier), L. Lortat-Jacob and L. Béthoux, Rev. d. l. Tuberc., October, 1924, v, 623.*—(*A. P.*)

Relation of Miliary Tuberculosis to Purpura.—A long time ago the existence of some relation between these conditions was envisaged by Waller, Charcot, Laveran, Forget, and others. However, in the classical text-books accounts of purpura, tuberculosis finds little or no mention along with other infections. As a matter of fact, it should be accorded a place of honor. The cases reported here have been verified by necropsy and include all known forms of hemorrhagic purpura. *Case 1:* A man of 23 was attacked with severe pains in the left hemithorax, with fever, and showed a left pleurisy with large effusion, which was tapped and some air admitted. A little later a diarrhea appeared and after a few days evidence of peritoneal effusion. His general condition declined, and a month after admission he had an intestinal hemorrhage, followed by epistaxis and purpuric spots on the skin. Later there were hematemesis and more cutaneous hemorrhagic spots. Blood cultures were sterile. Death followed. Autopsy showed 800 cc. of hemorrhagic fluid in the peritoneum. The intestinal coils were agglutinated and the serous surfaces studded with tubercles, which were especially abundant along the mesenteric vessels. The stomach and intestinal mucosa showed hemorrhagic infiltrations as far as the submucosa. The spleen, liver, kidneys and suprarenals showed tubercles. The left lung showed a few scattered tubercles and at the hilum a large, caseous gland. The pleura contained 1.5 litres of clear fluid. The right lung showed bronchopneumonic congestion, with a few scattered tubercles and large caseous hilum glands near the beginning of the first eparterial bronchus. The pericardium showed a little fluid and some punctiform hemorrhages on the cardiac surface. *Comment:* In this case, ushered in by a pleurisy with effusion, later complicated by a contralateral pleurisy and a peritonitis, a miliary tuberculosis developed, apparently initated by a hemorrhagic syndrome. Histological examination of the skin and digestive tract showed typical tuberculous follicles adjacent to intestinal ulcerations and purpuric lesions, which showed the presence of tubercle bacilli in stained sections. Scurvy, leucemia, and secondary septic infection can all be eliminated. It is noteworthy that the hemorrhagic abdominal phenomena followed partial resorption of the pleural effusion which probably favored the entrance of bacilli into the circulation. The diarrhea was the earliest symptom of peritoneal involvement. *Case 2:* A patient, aged 22, was admitted with pains in the left chest, and showed a rapidly forming effusion, requiring aspiration. The fever at first fell, later became irregular, and the general condition declined. Six weeks after admission there was a profuse intestinal hemorrhage, shortly followed by telangiectases and ecchymoses of the anterior part of the body. Death occurred and at autopsy the intestinal coils were found agglutinated. The great omentum contained caseous masses, and the visceral peritoneum showed tubercles of all sizes and stages, together with hemorrhagic foci. There were ulcerations in the ileocecal region. There were tubercles in all the

organs and large caseous glands at the hilum on both sides. *Case 3:* The patient, aged 22, was admitted with a double pleurisy with effusion. He had fever, rapid pulse and cyanosis. The spleen was enlarged and there was fluid in the peritoneum. About three weeks after admission hemorrhagic spots appeared on the arms, thighs and anterior trunk. Autopsy showed numerous peritoneal tubercles, and the spleen contained caseous masses, and the other abdominal organs and lungs contained tubercles. The hila showed large caseous glands. *Case 4:* The true diagnosis was not made until autopsy. The patient came in with edema of the lower extremities, ascites, hydropericardium and double hydrothorax with no fever, and was thought to be a case of nephritis. He showed ecchymotic purpuric spots on the lower limbs. He died suddenly after two weeks, and autopsy showed the peritoneum studded with tubercles of all sizes. The left kidney showed voluminous caseous masses beginning to liquefy, the right kidney showed one such mass, and both showed the lesions of diffuse nephritis. Again large caseous glands were seen at both hila of the lungs. The testicles showed caseous degeneration, and the left showed a small cavity in the epididymis. The original lesions seemed to have been at the hila of the lungs and in the testicles. The striking feature of this case was the absence of fever. One more case of purpura developed following the treatment of a patient with a pleuritic effusion by Gilbert's autoserotherapy. This patient also developed a tuberculous meningitis. It is clear that this method of treatment ought to be abandoned, as others have seen similar distressing results, and as we know that we are injecting under the skin a liquid containing tubercle bacilli. *Conclusions:* 1. Purpura developing in the course of chronic tuberculosis means a miliary dissemination of the process. 2. Acute nonbacillemic forms of phthisis are never accompanied by purpura. 3. Bacillemia is necessary for the production of purpura and other manifestations of generalization should be sought for.—*Les rapports de la tuberculose granulique avec le purpura hémorrhagique, A. Pratsicas, Rev. d. l. Tuberc., October, 1924, v, 642.*—(*A. P.*)

Erythema Nodosum and Tuberculosis.—While there is a general agreement as to the clinical features of erythema nodosum, great diversity of opinion exists as to its cause and value. Authorities on diseases of the skin associate it with rheumatic conditions, malaria, digestive disorders, autointoxication, drugs, chorea, endocarditis and quinsy, tuberculous meningitis, streptococcal infection, ptomaine poisoning, intracutaneous injection of tuberculin, syphilis, and cerebrospinal fever. It has been suggested that it is an acute specific fever and the term "nodal fever" or "febris nodosa" given. It would appear that the isolated sporadic cases, which constitute the bulk of the disease, are associated with various infections of which an important one is tuberculosis. Many investigators believe it to be due to a tuberculous bacillemia. Moro, after the rubbing of a tuberculin ointment into the skin of the chest, has seen erythema nodosum break out on both feet. Chauffard and Trousier, in applying the traditional reaction with a dilute tuberculin, witnessed the development of a nodule exactly like erythema nodosum. From a study of cases and the literature it would appear that erythema nodosum, as a tuberculous manifestation, may occur on the outbreak of a tuberculous bacillemia arising from a focus in the body, such as caseous bronchial, mesenteric or cervical lymph nodes, and this may be followed by death in three or four months from tuberculous meningitis. But tuberculous bacillemia is not necessarily fatal, and in less severe cases the natural resistance of the body is sufficient to overcome the bacillary invasion, and then pleurisy or limited infiltration of the lung occurs. In other cases erythema nodosum occurs in the course of tuberculous disease of the hilum lymph nodes when a chronic smouldering infection bursts into activity. One must conclude that tubercle bacilli and their products pass into the circulation, and erythema nodosum results. If this is correct the nodes would be analogous to the rose spots in typhoid fever and the secondary eruption of syphilis. The nodose eruption in erythema nodosum differs from the tuberculides. It always clears up in a few weeks, and leaves no scarring, whatever the bacterial cause may be. Cornet says the tuberculides do not arise from bacilli with a high degree of pathogenicity, but from dead human bacilli, fragments of bacilli, and bovine bacilli, as well as from the toxins. It is likely that septic conditions of the tonsils and teeth causing mild septicemias may account for many cases of erythema nodosum.—*On Erythema Nodosum and Its Association with Tuberculosis, J. A. Watt, Brit. J. Tuberc., January, 1925, xix, 37.*—(*B. T. McM.*)

Effect of Erythema Nodosum on Tuberculosis.—These observations on five children, from 2 to 7 years of age, with erythema nodosum and known tuberculosis, determined roentgenologically and by tuberculin, corroborate earlier views on the activa-

tion of tuberculosis by erythema nodosum, which is viewed as a specific infectious disease.—*Über Verschlechterung resp. Manifestwerden von Hilustuberkulose im Anschluss an Erythema nodosum, A. Wallgren, Beitr. z. Klin. d. Tuberk., 1923, lvii, 1.—(H. J. C.)*

Renal Tuberculosis.—Renal tuberculosis is a disease of unusual interest because of the two distinct clinical varieties which we call *medical* and *surgical*, respectively. In the medical form the disease is bilateral; infection is nearly always hemic; there is a coexistent parenchymatous nephritis; the urine is clear but contains tubercle bacilli, albumin of sanguineous origin, and hyaline and granular casts. Physical signs of chronic nephritis, in the form of edema with arterial and cardiac changes are often present, and death from uremia is not uncommon. The actual tubercles are scattered irregularly throughout the cortex and medulla, the greatest number being in the cortex; though tubercles are often limited to the cortex they are seldom found in the medulla without a cortical lesion. In the surgical form the disease is unilateral at its beginning; infection takes place by the blood or lymph; the urine is cloudy or turbid and contains tubercle bacilli, pus cells, caseous material, fragments of renal tissue, phosphates, red blood corpuslces and albumin of pyogenic origin. The focal lesions are limited in number, and undergo caseation and liquefaction, forming an open or closed tuberculous abscess. It is curious that two types should exist with such wide clinical differences, the one with multiple tubercles and albuminuria, and the other with a limited number of tubercles and pyuria. The difference is probably only one of degree. In the medical form, the resistance of the kidney is lowered by a toxic inflammation which accounts for the albumin in the urine, and by frequent assaults by myriads of bacilli which are suddenly liberated from the primary focus, for instance, the lung. When the kidney no longer can excrete all the bacilli multiple abscesses develop. That they do not undergo caseation and liquefaction is due to the fact that death cuts the process short. In the surgical variety the tubercles form only after attacks by a small number of bacilli at considerable intervals, aided by a local rather than a total lowered resistance. These tubercles remain dormant for months or years, and eventually undergo caseation and liquefaction, changes typical of a chronic infection. It is now known that surgical renal tuberculosis is primarily unilateral, and that the only hope of cure lies in an early nephrectomy. Spontaneous cure is extremely rare, and only a few authentic cases have been published in which the disease in the kidney appears to have been arrested. Cases have been reported in which patients with a tuberculous kidney have lived 10 to 30 years. These are rare instances of autonephrectomy. Bilateral surgical tuberculosis is practically always secondary to a primary unilateral infection. Autopsy figures for bilateral infection are from 64 to 68 per cent. The right kidney is more often affected than the left. The commonest age of incidence is from 20 to 30 years. Tubercle bacilli reach the kidney by either the blood or lymph. The ureteral route can be disregarded, as it has been proved that microörganisms cannot pass directly up the ureter from the bladder. Pathologically there are three types of chronic renal tuberculosis: (1) primary closed parenchymatous tuberculous nephritis, (2) primary open tuberculous pyelitis or pyelonephritis, and (3) combination of these two. The term, *closed*, means that the products of disintegration are not being emptied into the bladder. The treatment of unilateral renal tuberculosis is early lumbar nephrectomy. At the present day the operative mortality should not exceed 2 per cent and the permanent cures should not be below 60 per cent. The results of surgical treatment of renal tuberculosis are not as good as they ought to be, but when the medical profession as a whole has learned to regard all mild cases of cystitis with suspicion, and when the ureters of a patient with a sterile purulent urine are examined for tubercle bacilli, there will be a negligible operative mortality, a great increase in the percentage of cures, and a corresponding diminution in the troublesome genitourinary complications.—*Renal Tuberculosis, C. A. R. Nitch, Lancet, January 3, 1925, ccviii, 1.—(B. T. McM.)*

Renal Tuberculosis and Chronic Nephritis.—A man, aged 45, died in the course of chronic hypertensive nephritis which was associated with asthma-like dyspnea. At autopsy one kidney was found transformed into closed caseous cavities; the other kidney presented the lesions of severe chronic nephritis with no evidence of tuberculosis. A tuberculous kidney, even though the lesions are closed, may endanger the opposite kidney. Furthermore, tuberculosis may lead to renal sclerosis of the ordinary variety.—*Tuberculose rénale fermées à forme de néphrite chronique hypertensive, Bouchut, Grivet and J. Dechaume, Meeting, Soc. Méd. des Hôp. de Paris, December 6, 1924, reported in Presse Méd., January 7, 1924, no. 2, 25.—(J. B. A.)*

Blood in Addison's Disease.—Addison, in his original description of the constitutional and local effects of disease of the suprarenal capsules, called attention to the anemic appearance of the patient. Since then the question of the blood findings has been considered by a number of workers, with some diversity of opinion relative to the existence of anemia. Seventeen cases of Addison's disease were studied at the Mayo Clinic. All were typical except one. Three cases came to necropsy, when definite lesions of the suprarenal glands were found. A study of the blood of these cases revealed the presence of a definite anemia in only 1 (6 per cent). A mild or questionable anemia was found in 4 cases (23 per cent). In 3 of 5 cases the cell-volume index was decreased, and in three the saturation index was increased, indicating small erythrocytes with high hemoglobin content. A relatively high lymphocytosis was present in the majority of cases. According to the dye method, normal circulating blood and plasma volumes were found in all but one case. Decreased percentages of water and of blood and plasma were found in 1 case during the period of acute suprarenal insufficiency. Anemia, when associated with Addison's disease, is apparently not due to a dilution or an increase in total blood volume, since large blood volume did not exist in the presence of anemia. Anemia was not masked by contraction of volume, since normal volume existed in all cases in which hemoglobin values were normal. Repeated volume determinations in 3 cases revealed in 2, marked fluctuation of cell and plasma volumes. The volume fluctuation masked only in a minor degree the percentage hemoglobin changes, since the normal all plasma-volume ratios were closely maintained.—*Volume and Composition of the Blood in Addison's Disease, G. E. Brown and G. M. Roth, Am. J. M. Sc., January, 1925, clxix, 47.*—(*J. S. W.*)

Amenorrhea of Puberty during Tuberculosis.—Pathological amenorrhea due to local conditions is rare. The amenorrhea of puberty is frequently one of the early signs of pulmonary tuberculosis which requires years for its complete development. "War amenorrhea" could just as well have been called tuberculous amenorrhea, since the basis was a latent inactive tuberculosis, of which the causative factor was the war, with its worry, starvation, strenuous work, etc. The absence of genital findings should lead to the suspicion of tuberculosis. Specific and hygienic-dietetic treatment of weak, anemic, irritable young women with headaches, and a strong tendency to colds, would tend to strengthen and increase their resistance. Tuberculin treatment in girls occasioned the proper appearance of the menses. Girls over sixteen years of age developed menses immediately after specific treatment.—*Studien über die Bedeutung der Pubertätsamenorrhöe in Verlaufe der Tuberkulose, C. Stuhl, Ztschr. f. Tuberk., May, 1924, xl, 189.*—(*H. J. C.*)

Skin Reaction in Tuberculous Meningitis and Generalized Miliary Tuberculosis.—In miliary tuberculosis and tuberculous meningitis neither a markedly positive nor a negative cutaneous test justifies prognostic deductions. The skin reaction indicates only that there is an immunity of the body, but not that this resistance is of any significance. In 65 per cent of 37 cases there occurred a positive skin reaction. This agrees well with the findings in America for miliary tuberculosis and tuberculous meningitis in children.—*Zur Bewertung der einfachen cutanen Tuberkulinprüfung für die Prognose der Kindertuberkulose, R. des Arts, Beitr. z. Klin. d. Tuberk., 1923, lvii, 220.*—(*H. J. C.*)

Surgical Treatment of Pulmonary Tuberculosis.—In certain cases partial collapse of the lung suffices to induce healing, and pneumothorax is successful in spite of the presence of adhesions. In more advanced chronic cases, however, mechanical conditions, and especially cavities and bronchiectasis, call for a full collapse, and when adhesions interfere surgical treatment must be considered. In certain cases isolated adhesions may be divided; this cannot be done until the field is inspected by the X-ray or thoracoscope. Precautions must be taken in sectioning bands which are vascular or which may be attached over a cavity or contain lung substance. Single strands may be cut with a long double-edged tenotome under direct fluoroscopic vision. Others, not so clearly defined, are divided with the galvanocautery, vision being secured with the thoracoscope: the technique of this operation is described. *Phrenic paralysis:* Removal of the complete nerve supply to one-half of the diaphragm paralyzes the muscle, and, because of loss of muscular tone, the dome rises up into the chest as much as 7.65 cm. on the right and 5.9 cm. on the left, and results in a one-sixth to one-third collapse of the lung, according to Brunner and Felix. Later the muscle atrophies, with an increase in these effects (Brunner). The nerve supply to the diaphragm is mainly through the phrenic, but in 20 to 25 per cent of the cases, according to Felix, motor fibres run in a separate

bundle along with the nerve to the subclavius muscle, joining the normal phrenic behind the innominate vein, the two bundles forming a loop around the subclavian vein. The phrenic nerve is joined by fibres from the sympathetic in the lower part of the neck and also from the coeliac ganglion. The twelfth intercostal nerve also supplies fibres direct to the diaphragm, but these are apparently of little consequence. Two operations have been devised to overcome the disappointments of simple division of the phrenic nerve. The first is *evulsion*, by which 30 to 40 cm. of the nerve is drawn out, destroying all connections. The risks include tearing through the subclavian vein, hemorrhage from the pericardio-phrenic artery and its two attendant veins, and tearing into the lung or mediastinal pleura: practically, however, such accidents are infrequent. Inflammation and fibrosis along the course of the nerve may prevent complete evulsion. As a substitute for evulsion, Goetze advocates *radical phrenicotomy*, dividing the nerve down in the neck and cutting its connections. The risks are theoretically slighter with this operation. Phrenic paralysis has been advocated as a substitute for artificial pneumothorax when social reasons make refills impracticable; in tuberculosis of the lower lobes, in certain cases in which pneumothorax has failed; in certain bilateral cases in which the nerve on the more affected side is divided; to arrest hemorrhage, and as preliminary to thoracoplasty to test the capacity of the other lung. Additional indications are intractable vomiting associated with cough in left-sided cases, or in bilateral cases in which the left side is more advanced; also cases of unresolved pneumonia. Complete disappearance of symptoms must not be expected, except in those cases in which the disease is limited to the lower lobe. *Apicolysis:* Artificial collapse of the upper part of the lung may be accomplished by stripping the parietal pleura of the inner surface of the chest, displacing the lung medially, and filling the resulting space with some foreign body such as paraffin, fat, fibroids, muscle, etc. The various methods of filling are discussed. The author has used living pedicle grafts of fat and breast tissue in women and the pectoral part of the pectoralis major muscle in men, the technique for which is described. Apicolysis is not considered a very serious operation. It is used in preference to pneumothorax in strictly localized upper lobe lesions, especially the fibrocavernous type. In more extensive lesions it is used only when pneumothorax fails and there are reasons against thoracoplasty. It may be employed in conjunction with artificial pneumothorax. The results in 7 cases are summarized. *Thoracoplasty:* This is the biggest and most serious of the operations. The collapse obtained is not complete but is constant: it is permanent, which is a good feature in the type of case selected, namely, the fibrocavernous case. Without operation in these cases the prognosis is uniformly poor. Considering this, the mortality rate is low, and considerable benefit is obtained in a substantial percentage of cases (237 out of 514 reported in the literature). After the operation the patient must continue to observe due precautions. Thoracoplasty is employed only when pneumothorax has been tried and has failed, or when symptoms reappear following reëxpansion. Any active disease, or more than slight healed disease in the better lung, is a contraindication. Complications, tuberculous or otherwise, elsewhere than in the larynx, contraindicate the operation.—*Surgery in the Treatment of Pulmonary Tuberculosis, H. M. Davies, Brit. M. J., December 20, 1924, no. 3338, 1145.*—(*J. B. A.*)

Critical Review of Thoracoplasty.—Thoracoplasty in pulmonary tuberculosis aims to accomplish healing of unilateral disease by collapse and functional rest of the lung. This result is attained through changes in the blood and lymph circulation occasioned by the collapse. Thoracoplasty in principle parallels the action of artificial pneumothorax; and is to be used only when pneumothorax is impossible because of adhesions. Although the views on pneumothorax are now fairly unified, the indications, dangers and technical details are still unsettled for thoracoplasty. Before thoracoplasty is done it must be ascertained that conservative methods, climatic immunoserological and finally pneumothorax therapy, have been exhausted. Brauer maintains that quiescent lesions on the contralateral side are no contraindication. Absolute unilateral lesions are rare. Saugman saw none without a slight affection on the opposite side in 400 cases of collapse therapy. Fresh hilum lesions and those in the lower lobes make the procedure questionable. Saugman is not so strict about the condition in the contralateral lung. The results with fibrotic productive forms are better than with exudative forms: Brunner, in evaluating Sauerbruch's material, found the mortality in the former to be 10 per cent and in the latter 43 per cent. Acute progressive unilateral or caseopneumonic processes are unsuitable on account of their unfavorable prognosis. Tuberculosis of other organs, such as the intestines, urogenital tract, bones and joints, and nonspecific affections of the kidneys and

heart contraindicate thoracoplasty, but mild and moderate laryngeal tuberculosis does not. Before doing thoracoplasty a pneumothorax should be attempted, since adhesions cannot be determined with certainty either clinically or roentgenologically. This precaution is not necessary when chest retractions or undoubted adhesions exist. It is bad to free adhesions by too great pressure, because of the danger of tears and consequent infection of the pleura. If the adhesions are string-like and not too thick, the Jacobaeus cautery method can be used. A thoracoplasty must result in a complete collapse, equal to that obtained with a good total pneumothorax, according to Brauer. With this in mind, Friedrich in 1907 operated on the first patient with success, producing a widespread, extrapleural thoracoplasty. This procedure was subsequently known as the Brauer-Friedrich operation. On account of its high mortality, however, less dangerous procedures were tried: (1) the Brauer subscapular-paravertebral plasty; (2) the Sauerbruch paravertebral resection; and (3) the Wilms columnar resection. According to the grade of collapse, operations can be divided into: 1. Those resulting in complete pulmonary collapse: (a) The Brauer-Friedrich technique (total bony extirpation). According to Sauerbruch the volume decrease occasioned is 900 cc. and, on account of the collapse attained, is best mechanically and anatomically. Friedrich to 1911 operated on 20 cases, 21 per cent becoming capable of work, and the operative mortality was 27.6 per cent. The ribs were removed in their entire breadth, but the direct operative dangers resulting from mediastinal flutter and pendulum respiration militated against its use. (b) The same mechanical effect is achieved by the Brauer subscapular-paravertebral resection. Properly performed, it gives equally great collapse and obviates the direct operative dangers. Originated by Brauer in 1911 in Hamburg, the technical details are reviewed in brief. This plasty gives (1) a total collapse of the lung and subsequent repeats are obviated, (2) slight thoracic deformity, (3) absence of mediastinal flutter and paradoxical breathing, (4) normal arm movement at the shoulder joint, (5) absence of postoperative neuralgias or zones of anesthesia in the arm or thorax, as well as abdominal hernias, and (6) absence of postoperative scoliosis. Brauer tried the method on 35 cases at Eppendorf. Wilms described his columnar resection in 1911 as "a method to narrow the thorax in pulmonary tuberculosis." The upper chest (3 to 4 cm. of first to seventh ribs) resection of Wilms was considered inefficient by Sauerbruch because of the danger of aspiration in the noncollapsed lower lobes. Later, 1913 and 1914, Wilms resected larger rib portions and down to the 9th rib, approaching more nearly the Sauerbruch paravertebral resection. Wilms reported 34 cases in 1914 with good operative results, the cases being mild with a marked fibrotic tendency. Sauerbruch made his first report in 1912. All the ribs are sectioned, beginning at the lowest, and the result is an extensive but not complete retraction of the lung. Sauerbruch in 1920, in his *Chirurgie der Brustorgane*, described his technique and results, which are reviewed in brief. The advantage of the Sauerbruch paravertebral resection is its greater speed of performance as it requires about 20 minutes compared to 1 or 1½ hours necessary for total thoracoplasty. Since the operation is performed under local anesthesia, the longer operation should not be viewed too seriously. Sauerbruch has performed the greatest number of cases. In the old total bone extirpation method Brauer recommended two to three stages on account of the operative dangers, while with the newer methods this is not essential. More operations are required only when the patient's condition will not permit completion at one sitting, or when the aspiration of sputum is feared.—*Kritische Übersicht über den derzeitigen Stand der Thorakoplastischen Operationen bei einseitiger Lungentuberkulose, F. Claus, Centralbl. f. d. ges. Tuberk.-Forsch., March, 1924, xxi, 433.*—(*H. J. C.*)

Phrenicotomy Treatment of Pulmonary Tuberculosis—The part played by the diaphragm in inspiratory widening of the thorax is not significant, and artificial paralysis of the diaphragm does not cause disturbances of respiration or circulation, and it favors expectoration rather than inhibits it. Only 2 of 24 phrenic exaireses performed were not successful. The detailed findings in his cases are given.—*Zur Behandlung der Lungentuberkulose mit künstlicher Zwerchfellähmung (Phrenikotömie), H. Hauke, Deutsche Zeitschr. f.Chir., 1924, clxxxv, 395.*—(*H. J. C.*)

Phrenicotomy in Pulmonary Tuberculosis.—There are numerous indications for phrenicotomy or exeresis of the phrenic nerve. The lesions should be preferably unilateral, but this indication is less absolute than for pneumothorax. Lesions at the base of the lung are most influenced, especially cavities, and the slowly evolving forms. The operation may be done when pneumothorax is impossible because of adhesions, and thoracoplasty is contraindicated by the general condition. It may supplement pneumothorax, either contemporaneously or sub-

sequently, when the contracted lung is allowed to expand but can not fill the chest cavity. Local anesthesia is advised. By twisting the nerve with the forceps one detroys its anastamoses and also any accessory phrenic, if present. Roentgenograms and fluoroscopy show diaphragmatic ascension of at least 10 cm. on the operated side, reduction of cavities, and respiratory inversion of the corresponding half of the diaphragm (Kienbock's phenomenon). The expectoration temporarily increases, but later greatly decreases. Greater benefit is then obtainable by the rest cure.—*La résection du nerf phrénique dans le traitement de la tuberculose pulmonaire, M. Proust, A. Maurer, J. Rolland and J. Valtis, meeting, Société de Chirurgie, December 3, 1924, reported in Presse Méd., December 6, 1924, no. 98, 979.*—(*A. P.*)

Phrenicotomy in Pulmonary Tuberculosis with Cavity.—A case is reported of phrenicotomy performed for cavity tuberculosis of the base of the right lung. The roentgenogram showed the elevation of the diaphragm, a consequent reduction of the capacity of the right hemithorax by one-third, and a partial collapse of the large cavity. Phrenicotomy may be used when pneumothorax is not attainable, to supplement the effect of a partial pneumothorax, and to prolong the effect of pneumothorax after it is abandoned. In the discussion of this report Sergent stated that the ultimate effect of phrenicotomy cannot be foretold. In one case he had seen the function of the hemidiaphragm reëstablished within a year. An extensive resection of the nerve should be done, not a simple section. Ameuille reported having performed 7 phrenicotomies with good immediate results, but infinitely less satisfactory final results. Six of these patients are dead, although an extensive resection was always done, and immobilization and elevation of the diaphragm were proved by X-ray.—*Phrénicotomie pour tuberculose cavitaire, J. Rolland, A. Maurer and J. Valtis, meeting, Soc. Méd. des Hôp. de Paris, December 19, 1924, reported in Presse Méd., December 24, 1924, no. 103, 1030.*—(*J. B. A.*)

Results of Phrenic Exairesis.—The value of phrenic exairesis, self-evidently superior to phrenicotomy, depends mainly on its combination with other surgical possibilities of the treatment of pulmonary tuberculosis, namely artificial pneumothorax or thoracoplasty. This can be noted objectively on the behavior of the sedimentation rate of the red blood corpuscles. Alone, the exairesis has limited value. There are reported 10 cases that were thus treated in which adhesions prevented the institution of artificial pneumothorax. Generally speaking, in all cases in which the disease is of exudative character no results were attained.—*Über die Erfolge der Phrenicusexairese, E. Lehmann, Ztschr. f. Tuberk., March, 1924, xxxix, 426.*—(*H. J. C.*)

Effect of Phrenic Exairesis on Diaphragm.—The result of phrenic exairesis is compared with that of phrenicotomy, the former being preferred since the latter never gives complete results. It is necessary, in performing exairesis, to withdraw at least 8 to 10 cm. of the nerve, to destroy the anastomosing branches. If this is done, a complete paralysis of the diaphragm is obtained. Signs of complete paralysis are high position and immobility of the diaphragm, aside from its paradoxic movement as shown in Biddorf's test (paradoxic behavior of the diaphragm on the exairesis side is noted during inspiration with the mouth and nose closed). Paralysis occurs, as a rule, immediately after operation, and is irreparable. Adhesions in the vicinity of the diaphragm and previous poor function are no drawback to a satisfactory functional result.—*Der Einfluss der Phrenicusexairese auf Stand und Beweglichkeit des Zwerchfelles, Edith Landé, Ztschr. f. Tuberk., March, 1924, xxxix, 418.*—(*H. J. C.*)

Indications for Thoracoplasty in Pulmonary Tuberculosis.—The operation is advised only after a trial of routine rest treatment is found inadequate to accomplish good and durable results. Satisfactory spontaneous healing may be attained in some cases in two to five years or longer; hence, drastic surgery is not to be advocated when the ultimate prognosis seems good, unless for personal reasons the patient desires it. Thoracoplasty is usually resorted to only after artificial pneumothorax has been tried and found wanting, most often because of interference from adhesions. Calcified and fibrotic lesions of limited extent in the better lung do not contraindicate the operation unless the vital capacity is below 50 per cent of the calculated normal: but a fresh deposit here is a deterring sign and it must be proved dependably latent before the operation is advised. The more pressing the need for collapsing one lung the more risk one must assume with the other or with any extraneous condition which, under less stringent circumstances, would be considered a contraindication: here the patient's wishes must be considered as the prognosis with or without operation is usually poor. By controlling toxemia by the collapse of one lung,

lesions in the functioning lung may at times be expected to heal more rapidly, but it must be remembered that the initial strain and shock of thoracoplasty are great. In acute pulmonary tuberculosis thoracoplasty is not advised. Nonpulmonary tuberculous complications, if so serious as to impair markedly local function or to threaten life, contraindicate the operation. But a principle to be emphasized is that any measure which eradicates or helps to dam up a source of toxemia in one tuberculous focus relieves the opposing forces of bodily resistance against the disease proportionately, and contributes just so much to the balance of this resistance against similar sources elsewhere. Nice judgment is required to determine the bearing of complications, but experience has shown that these—even intestinal tuberculosis—not infrequently are more helped than hurt following the operation. The same principle applies more or less to nontuberculous complications. Poor cardiovascular tone, common in tuberculosis, may be so pronounced as to bar major surgery. The indications for thoracoplasty are reasonably positive and clear-cut, existing chiefly in chronic fibrocavernous, predominantly unilateral tuberculosis when more conservative measures have been tried and found inadequate. In this class of cases four subgroups are designated: 1. Cases coming to treatment with histories of long-standing disease, in which a short period of observation demonstrates that effective anatomic healing is impossible and that chronic illness is likely to continue. 2. Cases, with subacute or chronic ulcerative and caseous pulmonary disease, in which rest or sanatorium treatment has produced a partial but not complete abatement of symptoms, and has transformed the lesion into a fibrocavernous one, as represented in the first subgroup. 3. Cases with few or no constitutional symptoms, but with unhealed cavities causing persistent cough and expectoration. The menace of dissemination of the disease, or of such accidents as hemotpysis, is present here, but the patient's attitude toward the operation must be considered. The surgical risk is least. 4. Infrequent cases in which the operation is advised to relieve the disabling contraction of massive scar tissue in healing lesions. There are intermediate groups in which the indications are not so definite. Thoracoplasty has been done to check otherwise intractable hemoptyses, but the risks of posthemorrhagic bronchopneumonia are great. In chronic tuberculous empyema, secondary to natural or induced pneumothorax or to simple pleural infection, with a draining sinus of the chest wall, thoracoplasty is often indicated, especially if a patent pleuropulmonary fistula persists. In cases with partial artificial pneumothorax, insufficient to collapse residual areas of cavitation, a partial or complete thoracoplasty may be indicated. In deciding on the employment of surgery in pulmonary tuberculosis, close coöperation of physician and surgeon is essential. Hygienic rest treatment is continued after the operation until satisfactory healing is attained.—*Indications for Thoracoplasty in Pulmonary Tuberculosis, J. B. Amberson, Jr., Med. J. & Rec., January 7, 1925, cxxi, 32.*—(*J. B. A.*)

New Apparatus for Artificial Pneumothorax.—This consists of only two parts, a system for injecting gas and a manometer. *System for injecting gas:* This comprises a glass cylinder graduated from 0 to 500 cc. and mounted on metal, and all-metal piston with a rack which is worked by a wheel by hand, a brake which holds the piston from moving by its own weight, and a stopcock to cut off the cylinder from the pleura-manometer circuit. *Manometer:* The old water manometer is discarded because of its too great mobility and the inertia of the liquid interfering with oscillations. Instead, a Vidi model aneroid manometer, entirely of metal, very sensitive, exact and strong, is used. It is graduated from −40 to +40 cm. water, and connected with both cylinder and needle by a V-tube and stopcock. *Operation:* The apparatus is easily filled by connecting the outlet stopcock with a balloon or reservoir filled with gas, and elevating the piston as one would fill a syringe. When the needle is in place the stopcock is opened. The descent of the piston causes gas to penetrate the pleura and increases its pressure, while elevation of the piston has an opposite effect. All of this can be done with one hand, hence an assistant can be dispensed with. Summing up, we have the following advantages: 1. The apparatus is entirely demountable and can be easily sterilized. 2. It is strong and the piston fits the cylinder perfectly. 3. It is of small volume, enclosed in a box 25 × 20 cm., the whole outfit weighing 3.5 kgm.—*Appareil à pneumothorax artificiel, Baillet (de Nimes), Presse Méd., November 5, 1924, no. 89, p. 1872.*—(*A. P.*)

New Technique for Artificial Pneumothorax.—The efficacy of filtration of the air or gas injected has been studied. A cotton filter has usually been employed, but as generally used it is of very small size and may be compressed still further by the pressure of the air passing through. Cotton impregnated with various antiseptics has been tried, also passing the gas through

antiseptic solutions; the first, however, requires too much pressure to force the gas through the filter, while the second method often adds liquid particles which are toxic and caustic. Felt is a very efficient filter, but too compact. Avellan now employs iodized cotton, prepared by heating for one hour in a sealed retort 25 gm. of absorbent cotton and 2 gm. of finely pulverized metallic iodine. After introducing this cotton in a specially provided filtration bulb in Robinson's apparatus and filling the apparatus with air, if one runs a little out of a needle on to filter paper impregnated with starch, one gets a characteristic violet spot showing the presence of combined iodine. This iodized air is not irritating to the pleura, it has an odor which may be utilized in detecting the injection of gas into lung tissue, and it is reasonable to assume that it may have definite therapeutic properties. Another precaution employed is to make an oblique puncture with Herbert's bistoury before introducing the needle through the chest wall in order to facilitate its introduction and avoid subcutaneous emphysema.—*Nouvelle technique du pneumothorax artificiel, J. A. Avellan, Rev. d. l. Tuberc., August, 1924, v, 530.*—(*A. P.*)

Registration of Compression Curve in Artificial Pneumothorax.—Plotting curves of compression in artificial pneumothorax is of real diagnostic value in supplementing clinical and radiographic examination. This is done by noting, during the insufflation, a series of points which denote the maximum and minimum pressures of the respirations. Subsequently, mean pressures are calculated, and a curve is drawn for each case. In this way the flexibility of the lung and the presence of adhesions are detected. The automatic register, which Bayeux has devised, eliminates all calculations, and provides a tracing of each insufflation. It also shows the progressive modification of design of each element of respiration. This register is used with a pneumothorax apparatus designed by the author.—*Enregistreur automatique des courbes de compression pour le pneumothorax artificiel, R. Bayeux, Meeting, Soc. de Pathologie Comparée, December 9, 1924, reported in Presse Méd., January 7, 1925, no. 2, 24.*—(*J. B. A.*)

Mean Intrathoracic Pressure during Artificial Pneumothorax.—This is another article dealing with the subject of intrapleural pressures in artificial pneumothorax, a subject which has aroused considerable interest among French phthisiologists since the paper by Kuss in 1920 before the French Congress at Brussels. The authors contrived to show graphically the oscillations of the ordinary water manometer by means of a float and needle registering on a drum. They determined that the mean pressure is always the arithmetical mean of the maximum and mimimum oscillations of the manometer, provided the mechanical force is constant. On the other hand, if the mechanical force is inconstant, and this can be demonstrated by having the patient change the type of his breathing, the arithmetical mean and the pressure mean no longer correspond. These facts they further demonstrated with the newer forms of French apparatus which, with their special supplementary manometers, permit of determining the mean pressure or resultant of all the intrapleural pressures as they vary during the phases of respiration. This mean pressure figure has its value as giving a concrete idea of the pressure within the pleural space much better than does a mere statement of the oscillation extremes; also, it enables one to plot a curve of the rise of pressure within the artificial pneumothorax cavity as gas or air is insufflated. But its value is overestimated by some writers, since the danger point is that of maximum pressure, as at the moment of cough, which obviously is not subject to computation. On the other hand, the oscillations of the ordinary water manometer give no exact idea of actual pressure, since their excursions are subject to so many physical factors, among them the diameter of the needle employed, the calibre of the manometer tube, and the diameter of the rubber tube connecting the needle and the manometer. It is even true that the greater the capacity of a hemithorax the wider are the oscillations of the manometer, even with the same apparatus, needles and tubing. Therefore, the ordinary water-manometer readings are a relative matter, and are of definite use only as a means of comparison in the hands of an operator who constantly uses the same apparatus.—*La pression moyenne intrathoracique au cours des pneumothorax artificiels; sa mesure par l'inscription graphique des pressions variables, J. Bertier and C. Loison, Ann. de. Méd., June, 1924, xv, 497.*—(*W. B. S.*)

Choice of Anesthetic for Thoracoplasty.—(1) *General anesthesia* is objectionable because of its irritating effect on the lungs, and because of the abolition of the coughing reflex, which protects the healthy lung as the other lung is collapsed and its cavities emptied. (2) *Regional anesthesia* is seldom complete, especially in the upper intercostal spaces where the thickness of the muscles interferes with infiltration. To avoid these difficulties two procedures have

been used. (3) *Mixed anesthesia,* in which regional anesthesia is supplemented by an inhalation at the moment of cutting the ribs. This leads to the inconvenience of interrupting the general anesthetic during the slower manoeuvres, and involves the danger of suppressing the coughing reflex. (4) *Regional anesthesia repeated:* A second infiltration of the intercostal spaces is performed after incising the soft parts. The anesthesia is complete at the end, but is insufficient in the beginning. These manoeuvres are long drawn out. (5) *Mixed anesthesia in reverse order:* This is suggested by the author, who gives first a general anesthetic (kelene), then a regional one (scurocäine); this has all the advantages of the foregoing without the inconveniences. Chalier, in his discussion of this paper, said he uses rectal anesthesia (ether); and he thinks the effect on the lungs to be less harmful than when the anesthetic is inhaled. Bérard prefers regional anesthesia because it allows freedom of operative manoeuvre, to which the patient may give his assistance, without involving the risk of pain or of pulmonary complications. General anesthesia is resorted to only for the nervous and faint-hearted, according to this operator. He starts by giving somnifene by mouth and morphine by injection, and then uses ethyl chloride for discontinuous anesthesia. He thinks ether by inhalation to be better than by rectum, as the dosage can be better controlled.—*À propos de l'anesthésie dans la thoracoplastie extrapleurale, Bonniot, meeting Soc. de. Chirurgie de Lyon, November 27, 1924, reported in Presse Med., December 17, 1924, no. 100, 1012.*—(*J. B. A.*)

Choice of Gas in Artificial Pneumothorax.—Danger of gas embolism on the first filling in pneumothorax treatment is by no means negligible. It is least with the gases best absorbed by the blood, and greatest with such gases as nitrogen and air, which are only slowly absorbed. Oxygen is comparatively rapidly absorbed, but is expensive. Furthermore, even with oxygen, gas embolism has occurred. Carbon dioxide is cheaper and more rapidly absorbed. It is the best gas to use for the first treatment. On account of its rapid absorption, however, it is not suitable for refills. The most practical gas for refills is washed and filtered air.—*Die Gasfrage in der Pneumothoraxbehandlung, O. Roepke, München. med. Wchnschr., November 14, 1924, lxxi, 1608.*—(*E. R. L.*)

Artificial Pneumothorax and Variation of Atmospheric Pressure.—This study supplements previous observations made after ascensions, including one in which the intrapleural pressure was measured before and after ascension between Chamonix and Montenvers. For this experiment a large pneumatic chamber was used, similar to those in use for testing aviators, and three subjects were studied. Two of these, fairly recent and uncomplicated pneumothorax cases, showed an extraordinary tolerance for enormous and rapid changes of pressure. The third patient, a case of five years' standing, who had had numerous effusions during treatment, was less adaptable, and a pressure corresponding to an altitude of 2000 metres caused him sufficient respiratory embarrassment to necessitate withdrawal of air from the chest. It is concluded that most pneumothorax patients withstand considerable and rapid changes in atmospheric pressure without difficulty, but when the pneumothorax is longstanding and the pleura much thickened adaptation is less perfect, due to the greater difficulty of diffusion of gas through the less permeable membranes.—*Pneumothorax artificiel et variations de la pression atmosphérique. Expériences encaisson pneumatique, C. Mantoux, Baron and Lowys, section d'études des scientifiques d. l'Oeuvre d. l. Tuberc., June 14, 1924, reported in Rev. d. l. Tuberc., August, 1924, v, 537.*—(*A. P.*)

Artificial Pneumothorax and Adaptation to Changes of Altitude.—The determination of the effects of changes of altitude on the intrapleural pressure of a pneumothorax case has an important practical bearing, because in each case there is a certain optimal degree of pressure desirable to maintain—in one case −2 or −3 cm. water, in another +15 or +20 cm. These patients often have their pneumothorax established near sea level, as at Paris, and later go to Hauteville, Leysin, or Davos. Clinical experience has shown that most of them bear these journeys very well, and a few patients have ascended mountains in the Alps either on foot or by railway, without ill effects. Manometric observations on two patients who went from Chamonix to Montenvers (a difference of 864 metres) and back were recently reported, showing a distinct influence of the ascent in elevating the intrapleural pressure and of the descent in lowering it, but the effects were not marked, requiring only the addition, or withdrawal of small amounts (25 to 125 cc.) to equalize the pressure. Some experiments were also carried out in a pneumatic caisson, with the assistance of M. Garsaux. These showed very prettily, in one case, a gradual change in intrapleural pressure from −6 +3 at an atmospheric pressure corresponding to sea level to an intrapleural pressure of +11 +13 at an atmosphere corresponding to an

elevation of 2000 metres, the time interval being 43 minutes. Within 20 minutes more the intrapleural pressure fell to +7 +10, and then on the return to sea level pressure, which consumed 25 minutes, it fell to −4−1. Two other patients, however, showed a very inconsiderable change in intrapleural pressure. These were more recent cases, and seemed almost indifferent to change in barometric pressure. On the other hand, long-standing cases, especially those having experienced attacks of pleurisy with effusion, do not bear change in altitude so well and may experience for a short time such symptoms as cough and slight dyspnea. *Mechanism of adaptation:* The difference in pressure at Chamonix and Montenvers corresponds to about 58 cm. of water, and between sea level and 2000 metres to 231 cm. of water. The change in the intrapleural pressure is only a fraction of this, for which there are two reasons: (1) the elasticity of the walls of the gas pocket, and (2) the phenomenon of gaseous exchange between the pleural cavity and the blood, shown by Rist. Both modes of adaptation function well in patients with a recently induced pneumothorax, whose pleura is thin and supple, but much less perfectly when the pleura has become thick and rigid. *Conclusions:* 1. Clinical observations show that pneumothorax patients stand without difficulty journeys from plain to mountains and vice versa. Both "pneumo-Alpinists" and "pneumo-aviators" have been observed. 2. Two series of experiments, one with a pneumatic caisson, have shown that physiological adaptation to altitude occurs very quickly. 3. "Young pneumos," with a thin supple pleural wall, adapt themselves almost at once to variations in pressure; "old pneumos," with a thick rigid wall, require more time. 4. It is possible for tuberculous patients in whom pneumothorax has been induced to undergo almost without inconvenience atmospheric and barometric changes.—*Pneumothorax artificiel et adaptation aux changements d'altitude, C. Mantoux, L. Baron and P. Lowys, Presse Méd., November 5, 1924, no. 89, 874.*—(*A. P.*)

Partial Simultaneous Bilateral Artificial Pneumothorax.—Forlanini's method, originally proposed to approximate the walls of large secreting cavities and then to immobilize and reduce zones of tuberculous bronchopneumonia and pneumonic infiltration, has been widely extended in its applications, but in all cases until recently the attempt has been to create as complete a lung collapse as possible. This procedure is open to a number of objections: its realization is only possible in strictly unilateral disease; the hyperfunction of the opposite lung may be detrimental to it and is, according to Parisot and Hermann, responsible for an elevation of basal metabolism and tendency to loss of weight observed in these patients early in their treatment. Besides this, pleural adhesions often render a complete collapse out of the question, leaving such a pneumothorax applicable to only 2 to 8 per cent of phthisical cases. It also appears to be responsible for certain complications: massive bronchial emboli in the sound lung, bacillary dissemination by the blood to other organs, especially the meninges in children. Even the lesions in the collapsed lung cannot always be arrested. Therefore, various authors, cited by Kindberg, have proposed a partial pneumothorax, and have shown that a semicompression of the lung is not devoid of benefit. The clearest indication for bilateral pneumothorax is the early development of extensive lesions in the better lung under ordinary pneumothorax treatment. It is known that there is a large respiratory reserve, and that survival is possible with only one-eleventh of the normal functioning lung area. The case is reported of a boy of 18, with a bronchopneumonic tuberculosis, at first confined to the left lung and treated by pneumothorax. After three months a dissemination appeared in the right lung. A partial right pneumothorax was instituted, maintaining in part that on the left. After three months a left pleural effusion occurred with febrile reaction. After this the patient improved. He never showed marked dyspnea, cyanosis, or alarmingly rapid pulse. He practically lost his fever and regained strength, weight and appetite. Two other patients have been similarly treated without embarrassment, and one with benefit. The method offers most promise in acute bronchopneumonic tuberculosis, rather than in the subacute ulcerocaseous forms where considerable excavation has occurred. If the lesions are bilateral from the start, the pneumothorax may also be so, the more affected lung being most vigorously treated. If a contralateral exacerbation occurs in a unilateral pneumothorax case the pneumothorax is then begun on that side, temporarily leaving the original pneumothorax alone but resuming it sufficiently to keep the lesion partly immobilized. A very close and constant observation of the patient is necessary if real benefit is to accrue.—*La pneumothorax partiel bilateral simultané (contribution à l'étude du pneumothorax thérapeutique), F. Bezançon and A. Jacquelin, Presse Méd., September 17, 1924, also report of section d'études scientifiques d. l'Oeuvre d. l. Tuberc.,*

May 10, 1924, in Rev. d. l. Tuberc., June, 1924, v, 424.—(A. P.)

Effect of Experimental Pneumothorax on Tuberculosis.—In experiments on rabbits, guinea pigs and a dog pneumothorax was studied. Highly virulent strains of human and bovine bacilli were used, in amounts of 1 cc. per kilo containing 1 mgm. of finely divided bacilli. In the rabbit both strains were used, thus producing a chronic disease with the human type which frequently healed spontaneously while the bovine type produced an acute, rapidly progressing disease. Pneumothorax resulted in a difference between the treated and untreated sides. It was thought that the higher the pneumothorax pressure the less blood there would be in the collapsed lung, and that the lung would develop more connective tissue. An increased lymph circulation could not be determined in the pneumothorax lung. It was definitely determined that pneumothorax has a favorable influence on chronic pulmonary tuberculosis, while in acute exudative tuberculosis the pneumothorax caused more marked caseous destruction and a more acute course. As a result of the collapse treatment the noncaseated tuberculosis progresses more rapidly to fibrosis, this occurring within 3 weeks. For complete healing of the tuberculosis in the pneumothorax lung the time required in the rabbit is naturally longer, from 6 to 7 months. Better results were obtained with compression pneumothorax than with low pressure pneumothorax. Tubercle bacilli die in the collapsed lung as a result of malnutrition. On the other hand, high-pressure pneumothorax was more harmful for the contralateral side than low-pressure pneumothorax. The author concludes that in monolateral chronic pulmonary tuberculosis a mild compression pneumothorax of at least 7 months' duration should be used.—*Die Pneumothoraxwirkung auf die Lunge mit und ohne Tuberkulose, C. Yoon, Beitr. z. Klin. d. Tuberk., 1924, lviii, 92.—(H. J. C.)*

Permanent Results of Artificial Pneumothorax.—About 1400 cases, dating back to a period of from 2 to 12 years, are considered in detail. Only those are evaluated in which a large satisfactory pneumothorax was obtained. In the majority of cases nitrogen was used, only a third of them receiving oxygen. In only 25 per cent of the cases an exudate developed. Gas emboli were observed in 0.1 per cent of the cases, but never with fatal results. Permanent results were obtained in 49 per cent of the author's own cases, and in 66 per cent of the cases of others. In the author's own cases the erythrocyte sedimentation rate was determined before and after the institution of pneumothorax, and the procedure was found regularly to diminish the rate.—*Zur Frage der Dauererfolge nach künstlichem Pneumothorax, H. Maendl, Beitr. z. Klin. d. Tuberk., 1924, lviii, 29.—(H. J. C.)*

Recompression of Tuberculous Lung by Artificial Pneumothorax.—A few reports have been made of a tuberculous lung being recompressed from a few months to two years after expansion following an original artificial pneumothorax. The case described here is that of a woman who was treated by pneumothorax (right side) from November 14, 1915, until March 28, 1916. She remained well until June, 1921, when she suffered a relapse. To control hemoptyses three unsuccessful attempts to induce pneumothorax on the same side were made May 17, 1922. On June 28, another attempt was made and 150 cc. of air introduced. Refills were continued until December, 1923, as much as 1,400 cc. of air being given at one time. X-ray examination showed the lung completely collapsed and free from adhesions, in spite of a previous history of pleurisy. In July, 1924, the patient reported herself as working and fairly well since January, 1924. The possibility of inducing artificial pneumothorax is best estimated by attempting to carry it out, despite the deterrent influence of the medical history.—*Recompression of a Tuberculous Lung by Artificial Pneumothorax after an Interval of More Than Six Years, R. C. Hutchinson, Lancet, January 10, 1925, ccviii, 74.—(J. B. A.)*

Artificial Pneumothorax in Lung Abscess.—Indications are given, comment is made upon various types of drainage and prognosis in such cases.—*Indications for Use of Therapeutic Pneumothorax in Lung Abscess, H. M. Rich, Radiology, December, 1924, iii, 472.—(H. S. W.)*

Pleurisies of Artificial Pneumothorax.—Pleurisy is the most frequent complication of artificial pneumothorax, occurring in about 60 per cent of 200 cases observed. It disturbs the course of treatment so much that an understanding of it is indispensable. The rare pleurises, due to secondary infection, and the negligible transitory slight effusions are disregarded in this discussion. Only frank pleurisies are considered which give rise to a considerable quantity of fluid, the tuberculous nature of which is now generally admitted. There are two principal forms, the liquid and the adhesive. *Liquid form:* This rarely ensues as the result of an acute accident. More often

the symptoms come on gradually, initiated by fever, which, appearing in the course of a pneumothorax proceeding smoothly, almost always means a pleural complication. Stethoscopic examination shows the presence of fluid by a succussion splash or by a *bruit de flot* after carrying out the *salut brusqué* recommended by Mantoux. Fluoroscopic examination shows the fluid very easily. In some cases the onset is latent, without any symptoms. Ordinarily, however, more or less marked constitutional symptoms appear, together with some increased dyspnea on effort, and spasmodic cough. These symptoms are of variable duration, but usually subside within four or five weeks. The evolution of the fluid is variable. It may diminish spontaneously after a short period or start to resorb after a single puncture. In other cases there is no tendency to resorption. Long-standing effusions frequently, although not invariably, become purulent. There are also inexhaustible effusions which continue to form and reform without any adhesions. One such case has now gone on for over five years. *Adhesive form:* Here adhesions form rapidly between visceral and parietal pleurae, and dominate the picture. They tend to close up the pneumothorax space and to pull vigorously on the lung, chest wall and mediastinum. The onset of this form is similar to the previous, pain perhaps being more marked. The fluid, however, increases less markedly than the adhesions which form rapidly and may enclose the fluid in several compartments. Percussion dulness appears sooner and is more marked. When the lung is held out to the chest wall the breath-sounds or râles may become quite audible, as well as pleural friction sounds. Radiological examination may show the adhesions clearly or may show only a uniform density of the hemithorax. On attempts at insufflation, even though a negative intrapleural pressure may exist at the start, very small quantities of gas soon cause it to become strongly positive. There is an inexorable tendency toward obliteration of the pleural cavity. Bands of adhesions may sometimes form without the presence of any fluid whatever. The different state of affairs in these two types of cases depends on the reaction of the pleura rather than the action or intervention of the physician. *Intermediary forms:* An initial liquid pleurisy may be followed by the development of adhesions obliterating the pleural cavity, or the adhesive form may follow after an interval. *Exceptional and grave forms: 1. Forms with early and rapid pus formation:* Fever and cachexia are marked, and death may occur from exhaustion, as in marasmus. Rarely amelioration occurs, and the fluid loses its purulent character. *2 Pleurisies following pulmonary perforation:* These have seemed very rare to Bernard and Baron, Bard to the contrary notwithstanding. Their appearance is often sudden and violent, with rapid production of purulent liquid, rich in bacilli. The pleuropulmonary communication is demonstrable by injecting a solution of methylene blue into the pleural fluid and finding it in the expectoration. The intrapleural pressure also gives important information, remaining practically about zero except in the case of a valvular opening, when it is markedly elevated, being only momentarily lowered by removal of gas, and giving rise to severe dyspnea and displacement of the mediastinal contents. The prognosis is almost always fatal. *3. There is also another rare form, the secondary rupture into the pleura or a bronchus of an encysted purulent pleurisy.* Encysted purulent pleurisies are always a menace, and these patients ought to be kept under careful supervision. 4. *Richly bacilliferous forms.* The presence of large number of tubercle bacilli in a pleural exudate indicates either a pulmonary perforation, or an especially virulent pleural localization. They may be followed, despite all precautions, by a tuberculous needle-track infection, and the formation of a cold abscess, or caseous formations external to the pleura which may break down, but are more amenable to treatment. *Treatment:* During the period of onset, usually febrile, the patient is kept at as complete rest as possible, no intervention being made except for symptomatic reasons, especially dyspnea and cyanosis. In such case the fluid is withdrawn if abundant; if not, removal of gas may suffice, leaving the pressure slightly under zero. A careful watchfulness of the local signs is necessary, with repeated fluoroscopic examinations. The opposite lung, the mediastinum, and the position of the diaphragm should be especially observed. Thus, in the liquid forms, evacuation is practised only when the liquid fills the pleural cavity or causes functional symptoms. There is no advantage in drying the pleura, and the formation of adhesions is very little affected by so doing. The intervals between insufflations will necessarily be considerably extended, both because of the presence of the fluid and the diminished permeability of the pleura. Most frequently the fluid will eventually disappear spontaneously, and the pneumothorax resume its course. In the adhesive forms one is led to evacuate the collections of fluid chiefly to have a place in which to introduce gas. The liquid is frequently encysted and withdrawal is very difficult. The introduc-

tion of 100 or 200 cc. of gas quickly raises the pressure to +20 cm. water or more. Nevertheless, it is desirable to preserve the pneumothorax as long as possible. In the richly bacilliferous forms as few punctures should be made as possible and all precautions taken to avoid needle-track infection. Aspiration and introduction of gas may be done through the same needle, alternately, and a flamed stylette should be passed through the needle before withdrawal. Heliotherapy is recommended for these purulent pleurisies. In the form with pulmonary perforation frequent puncture and evacuation of fluid is advisable, but must be carefully carried out to avoid infection of the chest wall. Certain authors recommend surgical treatment, but a purulent tuberculous pleurisy opened surgically is unlikely to heal. *Prognosis:* Pleurisy, while a frequent complication of pneumothorax, is rarely a grave one; probably in not over 10 per cent of cases. The liquid forms often influence the course of the pneumothorax favorably. The adhesive have an unfavorable effect when they obliterate the pneumothorax too soon, and also by reason of the marked retractions and displacements that they cause. The ultimate results in the pleurisy cases are about the same as in those where it did not occur. Pleurisy represents an obstacle in the course of pneumothorax, but not a serious one. Its frequency should never be considered as an objection to a pneumothorax otherwise indicated.—*Les pleurésies du pneumothorax artificial, L. Bernard and Baron, Presse Méd., December 10, 1924. no. 99, 981.*—(*A. P.*)

Dry Pleurisy in Artificial Pneumothorax.—Dry pleurisy in artificial pneumothorax is relatively frequent. Even though adhesions occur because of dry pleurisy the end-results need not always be unfavorable, since the constitutional benefits can exert a direct curative effect upon the diseased lung.—*Über die Pleuritis sicca beim künstlichen Pneumothorax, Warnecke, Beitr. z. Klin. d. Tuberk., 1924, lviii, 83.*—(*H. J. C.*)

True and False Images of Cavity in Artificial Pneumothorax.—During the period of establishment of a pneumothorax various interesting radiographic modifications occur. Pulmonary collapse may put in evidence cavities previously invisible or masked. Also, when there are pleural pockets, "false cavities" may appear, or, on the other hand, pneumothorax may cause preëxisting "false cavities" to disappear. When, however, cavity images continuously persist or increase this is a strong indication of actively evolving lesions in the collapsed lung.—*Étude des vraies et fausses images cavitaires au cours du pneumothorax thérapeutique, F. Bordet viiie Congrès d. Méd. d. Langue Française d. l. Amérique d. Nord, Quebec, September 10–12, 1924, reported in Presse Méd.. November 5, 1924, no. 89, 878.*—(*A. P.*)

Influence of Artificial Pneumothorax on Symptoms.—Frequently with artificial pneumothorax, there is an increase in temperature, as a result of the flooding of the body with toxins. After this there comes a drop in fever in the favorable cases, associated with a diminished circulation in the collapsed lung and a diminished arterial supply to the tissues, a slowing of the lymph stream and a lessened resorption. In the majority of cases the pulse curve parallels the temperature curve. The weight curve seems to be of the greatest significance to the author, because it is a measure of the resistance of the body. An early increase in weight should, however, not lead to the belief that the case is prognostically favorable. The hasty transfer to an ambulant condition under such circumstances is not justified.—*Der Einfluss des Künstlichen Pneumothorax auf Temperatur, Puls, Atmung und Gewicht der Tuberkulösen, U. Winkler, Beitr. z. Klin. d. Tuberk., 1924, lviii, 118.*—(*H. J. C.*)

Pneumoperitoneum during Operation for Artificial Pneumothorax.—A case is reported with bilateral tuberculosis and numerous pleural adhesions, in which an attempt was made to institute pneumothorax on the more involved side. A phrenicotomy had been performed on this side earlier. After numerous attempts to penetrate the adhesions, a last insertion of the needle into the eighth intercostal space in the midaxillary line was tried. Here there were respiratory manometric variations and gas was introduced under low pressure. There resulted a pneumoperitoneum. The diaphragm had been drawn up so high following a phrenicotomy that the needle passed through it directly into the peritoneal cavity. The gas was rapidly absorbed from the peritoneum without consequence.—*Über einen Fall von Pneumoperitoneum enstanden bei dem Versuch der Anlegung eines künstlichen Pneumothorax, O. Amrein, Beitr. z. Klin. d. Tuberk., 1924, lviii, 131.*—(*H. J. C.*)

Obliterative Adhesions in Artificial Pneumothorax.—In pneumothorax it is uncommon for the collapse of the lung to be complete, as there are almost always pleural adhesions, or patches of fused pleura.

The collapse, however, may be sufficient to produce good results clinically. But in such cases the areas of adherent pleura tend to become larger and larger, until eventually the pleura is entirely adherent and the pneumothorax cavity becomes obliterated. This cannot be prevented, although by giving small frequent refills it can be delayed: it is useless to try high intrapleural pressures. To stretch adhesions, small frequent refills are also given, high pressures being deemed unnecessary. Reëxpansion of the lung almost invariably is followed by the formation of extensive firm adhesions, preventing reproduction of the pneumothorax. Partial reëxpansion, allowing partial contact of the visceral and parietal pleurae, usually results in adhesions, which may form in a few days; complete obliteration may follow. Following pleural effusions the base of the lung often becomes adherent, the adhesions then spreading upward. Eight case records are summarized to show that, in spite of obliterative adhesions, pneumothorax maintained for only a few weeks or months may be beneficial, although in most cases a complate collapse maintained for a sufficient length of time is necessary to secure good results. Eight reproductions of chest roentgenograms are included.—*Obliterative Pneumothorax, L. S. T. Burrell, Tubercle, January, 1925, vi, 162.—(J. B. A.)*

Eosinophiles during Tuberculin and Artificial Pneumothorax Treatment.—In 2 of 10 cases treated with tuberculin there was an increase in esosinophiles, persisting for a number of weeks, which was associated with improvement. In 2 other patients, in whom the tuberculin caused improvement, the increase did not occur. In the remainder the action was questionable. With general treatment there can be an increase of eosinophiles with progressive improvement, although they may remain within normal limits. The leucocyte counts may increase after tuberculin, though not regularly, for 24 to 48 hours. Increased values gradually drop to normal with improvement, while with unfavorable progression they continue to increase. After krysolgan treatment there occurs an increase in leucocytes, while the eosinophiles remain uninfluenced. Aolan injections do not influence the leucocytes or eosinophiles. The entire blood picture, and not only the eosinophiles, should be watched during tuberculin treatment. In 4 of 7 pneumothorax patients with improvement, the eosinophiles increased, and persisted so for a number of weeks, while in cases not improved by pneumothorax no such effect was noted. The increase is attributed to autotuberculin action.—*Über Blutuntersuchungen mit besonderer Berücksichtigung der Eosinophilen nach Tuberculin- und Pneumothoraxbehandlung, Michels, Beitr. z. Klin. d Tuberk., 1923, lvii, 13.—(H. J. C.)*

Specific Treatment of Tuberculosis.—Ruppel recommends a combination of passive and active immunization in the treatment of tuberculosis. By systematic active immunization of cattle it is possible to obtain a serum, through the use of which healthy animals may be so protected that a subsequent tuberculosis takes on the characteristics of a superinfection. The action of this serum is well seen experimentally, when it is injected intraperitoneally into guinea pigs, and living tubercle bacilli are injected 24 hours later. Within a half-hour all of the injected bacilli are to be found within cells, chiefly of the large mononuclear type. Only a few polynuclears containing bacilli are found. The latter rapidly decrease, and in a short time bacilli are found only in the mononuclears. Rapid destruction within these cells occurs; after 5 days bacillary forms have disappeared, and nothing is left of the bacilli except intracellular granules. Normal serum has no such effect. When normal serum is injected, and followed 24 hours later by living tubercle bacilli, a leucocytosis occurs, but without phagocytosis of the bacilli by mononuclear cells. True macrophages appear only after two days. The polynuclears decrease slowly. After 10 days numerous mononuclears containing bacilli are seen, and the bacilli show no signs of degeneration. The peritoneal response of the superinfected animal is similar to that seen in the primarily infected animal protected 24 hours before the infection by serum injection. The protective effect as observed in the peritoneal exudate furnishes an index for evaluating the potency of an antituberculosis serum. From highly potent sera a pseudoglobulin may be prepared by an electro-osmotic method, which stimulates phagocytosis five or six times more actively than the corresponding serum. The clinical value of this pseudoglobulin on intravenous and subcutaneous injection in man has been demonstrated. Objection has been made to the use of a heterologous serum in the treatment of tuberculosis in man on the ground of anaphylactic response in the course of the necessary repeated injections, and on account of the transient action of foreign serum. It is true that repeated injection of the foreign serum is necessary. Accordingly, the use of a human antiserum would be better if feasible. In actual practice, in such a widespread disease as tuberculosis, it is not practical to use the serum of patients recovering from tuberculosis. However, exudates and

transudates from persons with tuberculosis often have a marked passively immunizing effect. Ascitic fluid from cases of decompensation of the heart, when tuberculosis is also present, is especially effective. A very active pseudoglobulin may be prepared from this fluid, which has been proved to have clinical value. A combination of such a preparation with the bovine immune serum has been found practical and useful. Patients are first given daily injections of 10 to 20 cc. of the bovine preparation; if within six weeks this has not bettered the condition of the patient, treatment with the pseudoglobulin from human sources is instituted. Results have been surprisingly good in cases of surgical tuberculosis. Pulmonary tuberculosis is more difficult to handle by the methods of passive immunization. Active immunizing processes are more effective. A lyophobe colloid preparation, obtained by the electrolysis of a suspension of finely powdered tubercle bacilli, is a useful antigen. The colloid, so precipitated at its isoelectric point, is dissolved in weak alkali and injected. It stimulates phagocytosis markedly, and is valuable in severe or progressive tuberculosis, where passive immunizing has failed to confer benefit.—*Neue Grundlagen für die spezifische Behandlung der Tuberkulose, W. G. Ruppel, München. med. Wchnschr., January 16, 1925, lxxii, 90.—(E. R. L.)*

Tuberculin in Experimental Tuberculosis.—The failure of tuberculin as a specific and certain cure is now universally admitted. In fact, it is open to question whether tuberculin therapy possesses any real value, and whether the favorable results claimed from its use are not derived from general sanatorium regimen. The majority of tuberculosis specialists, however, claim that tuberculin therapy is of undoubted value when individualization in treatment is possible. The absence of experimental proof in support of this form of treatment is specially significant. The difficulties of the laboratory worker who attempts the tuberculin treatment of experimentally infected animals (guinea pigs) are many. These include the question of dosage and interval, the detection of reactions, and the individual variations in the susceptibility of guinea pigs to tuberculosis. A definite minimum lethal dose acting within a rasonable time cannot be established. Hence, for any immediate conclusions to be drawn from the experimental results, a considerable number of animals must be used in order to eliminate some of these discrepancies. In addition, in any scheme of experiments in which batches of animals are treated with the same doses at fixed intervals, the consideration of each case on its own merits is lacking. In evaluating results the weight curve must not be taken as a criterion of improvement, for many infected animals will continue to gain weight until the disease becomes widespread. The drying up of an ulcer or the shrinkage of a lymph node must not always be interpreted as evidence of healing, much less cure, for it is typical of tuberculosis that the disease heals in one area while it spreads in another. Fibrosis indicates only that a certain amount of cure has taken place in the area examined, and does not contraindicate the evidence of active tuberculosis elsewhere. The only proof of cure is the survival of treated animals with the death of the controls. *Experimental work:* Guinea pigs were injected with living tubercle bacilli and then treated with several vaccines to ascertain whether benefit or cure resulted, and, if so, which type of vaccine was the most efficient; or whether actual harm resulted. A group of guinea pigs was inoculated, and three weeks later the 25 survivors were used in the experiment. Eight were treated with bacillary emulsion, 9 with a "detoxicated" vaccine, the remaining 8 serving as controls. The bacillary emulsion contained 1 mgm. of heat-killed tubercle bacilli per cubic centimetre. The "detoxicated" vaccine contained the alkali-soluble products of tubercle bacilli, each cubic centimetre representing 100,000 million bacilli. The investigation was concluded about one hundred days after the preliminary infection, when all but 3 of the animals were killed. As judged by the body weight, the period of survival, and the microscopic findings, tuberculin treatment of the infected guinea pigs was not only ineffective in controlling the infection, but was actually harmful. Corresponding results were obtained by a co-worker (Prof. Kettle) using undiluted diaplyte (Dreyer's) vaccine. —*Tuberculin Treatment in Experimental Tuberculosis, L. S. P. Davidson, Lancet, January 3, 1925, ccviii, 13.—(J. S. W.)*

Theory of Effect of Tuberculin.—Allergy is elicited only in the animal body that is infected. Lately Rieckenberg has mentioned the fact that there is in tuberculin both a thermostable and a thermolabile constituent, and claimed that unheated culture-broth introduced into animals will produce allergy. To test the correctness of this thesis, 5 guinea pigs giving no skin reaction to tuberculin were injected with filtered broth (1 cc.) and bacillary emulsion at intervals of several days, up to five or six doses. The skin became sensitive to old tuberculin in some of the animals, but

this undoubtedly came from infection by bacilli that must have been present in the filtrate which was thought to be sterile.—*Zur Theorie der Tuberkulinwirkung, W. Curschmann, Deutsche med. Wchnschr., January 23, 1925, li, 147.*—(*H. S. W.*)

New Tuberculin.—If any chemical substance could be found to dissociate the acid-fast substances from its union with the other constituents of the tubercle bacillus at a comparatively low temperature and without loss of time, it would make the protein constituents of the bacillus more easily accessible to simple solvents, and hence, capable of more readily stimulating the production of specific antibodies. Phosphorus trichloride seems to have this action, but also reacts with the protein constituents of the bacilli. It gives a color reaction with all bacilli and with other organic substances containing protein. The color is purplish-brown. Enough water must be added to act catalytically; too much will interfere with the reaction, and there will be no reaction with absolutely anhydrous material. Under proper conditions violent effervescence takes place with the evolution of irritating fumes, causing severe cough and headache if inhaled. Although the original mixture is liquid, the end of the reaction is indicated by its becoming a firm pasty mass, which can be taken up in water. This precipitate is the basis of the author's tuberculin. A healthy guinea pig bore large doses of this new preparation with impunity. A seriously diseased animal (tuberculosis?) also bore the same dose, and even appeared to be better twelve hours afterward. Two more doses were given, larger than the above and at twenty-four-hour intervals. These doses were equally well borne, and the next day the animal was markedly better in health. The substance apparently had not the lethal property of old tuberculin towards tuberculous animals. A weekly dose was thereafter administered until all the enlarged lymph nodes disappeared. The animal was finally killed and no trace of disease in the lymph nodes could be found, but the spleen showed a few healed tubercles. An emulsion of the spleen injected into another guinea pig produced no disease. Six rabbits, infected with virulent bovine tubercle bacilli, were treated with the "new tuberculin." Two lived definitely longer than the control, one being killed at fifty-five days and the other dying of snuffles over five months after infection. Both showed large well-defined tubercles in the lungs in the process of healing. Encouraged by these results, cases of lupus vulgaris and surgical tuberculosis in human beings were treated with this new preparation. These cases responded very favorably. Finally the stuff was used on a far advanced case of pulmonary tuberculosis. All symptoms, except the fever, were rapidly ameliorated, and flesh was gained. Later the patient developed a spontaneous pneumothorax and shortly died.—*A New Tuberculin, A. Lundie, Brit. M. J., February 28, 1925, no. 3348, 405.*—(*J. S. W.*)

Advantageous Method of Administering Tuberculin.—Undesirable effects are occasioned by errors in the concentration of the injected tuberculin solution which cannot be forseen. This can be obviated by mixing in the syringe the pure tuberculin with the blood or the serum of the patient. Ten afebrile cases of pulmonary tuberculosis were thus treated with good results.—*Über die zweckmässigste Anwendung des Tuberkulins, C. Fischer, Ztschr. f. Tuberk., April, 1924, xl, 28.*—(*H. J. C.*)

Inunctions in Tuberculosis.—Intracutaneous tests with old tuberculin and with A, F, and N, before and after treatment with inunctions, and tests with old tuberculin before and after treatment with *Terpestrol* ointment according to Heinz, revealed no difference between children treated with an indifferent lard, or given only hygienic-dietetic treatments, from those treated specifically. It is concluded from this that inunction treatments in tuberculosis are of no especial value, whether in the sense of a general stimulation therapy or to stimulate the immune-body formation of the skin.—*Über Seifenkuren bei Tuberkulose, K. Brünecke, Beitr. z. Klin. d. Tuberk., 1924, lviii, 187.*—(*H. J. C.*)

Ponndorf Cutaneous Treatment of Pulmonary Tuberculosis.—The Ponndorf cutaneous treatment does not have any exceptional value. Most careful criticism in the judgment of cases for the treatment is essential. Harmful effects cannot be avoided, and they appear more frequently and are of a more severe nature than following subcutaneous methods of treatment. The advantage of simplicity in administration and avoiding inoculation is outweighed by the disadvantages of entirely unsatisfactory dosage.—*Zur Bewertung der Ponndorfschen Cutanbehandlung der Lungentuberkulose mit Alttuberkulin, J. Fürbringer, Beitr. z. Klin. d. Tuberk., 1924, lvii, 302.*—(*H. J. C.*)

Tuberculin by Mouth.—Contrary to the results of Klotz and Fornet, Czickeli observed practically no effect following the oral administration of tuberculin. In 11

out of 12 children with tuberculosis 100 mgm. of old tuberculin did not affect temperature pulse, respiration or body weight. In one case a positive Meyer-Bisch reaction occurred.—*Ein Beitrag zur Frage der Tuberkulinisierung per os, H. Czickeli, München med. Wchnschr., December 5, 1924, lxxi 1724.*—(*E. R. L.*)

Tuberculin by Mouth.—Immunizing processes and immune reactions on oral administration of the antigen, once the subject of marked skepticism, have been placed on a scientific basis through the work of Fornet and Deycke. Klotz is able to confirm their results on the tuberculin reaction, finding that a general reaction with fever and a focal reaction occurred on administration of tuberculin *per os* in tuberculous children. Special confirmation was obtained through the Meyer-Bisch reaction. Meyer-Bisch found that the tuberculous subject, unlike the normal, had a higher protein concentration in the blood in the morning than in the evening. Tuberculin, however, caused a reversal of this condition, the protein curve following subcutaneous administration of tubrculin approaching the normal. Klotz finds that this same reversal occurs on oral administration of tuberculin. Most marked effects are secured with the Much partigen *MTbR*. However, identical, although less striking, effects were obtained with old tuberculin, Fornet's *Edovaccin* and other tuberculin preparations. With these preparations larger amounts were required to secure the same effect as that achieved with a minute dose of *MTbR*, but the type of reaction ensuing was quite the same. Three drops of a 1:10 million dilution of *MTbR* was sufficient for a marked effect. This contains 0.000,000,025 mgm. protein. Partigens *F* and *N*, which are practically protein-free, gave no result which could be detected by the refractrometric measurement of serum proteins.—*Tuberkulin per os, M. Klotz, München. med. Wchnschr., September 26, 1924, lxxi, 1347.*—(*E. R. L.*)

Partigen Treatment of Tuberculosis.—It is maintained that the fat partigens *F* and *N* are free from nitrogen-containing substances. An *L*-free filtrate by precipitation with tannin was prepared and studied. It is believed that only three partigens are necessary, "pure tuberculin" and the fat partigens *F* and *N*. The importance of the lipoid bodies is again stressed. Two new preparations are used, one in which entrance into the skin is aided by mixing infusorial earth with the ointment. *MTbR*, compared with the individual antigens, has proved best. The other method has been the administration of the partigens in drop form by mouth, after proving that the partigens pass the digestive juices unharmed. A favorable influence on the tuberculosis was thus noted. *MTbR* in strong solution was given in daily increasing doses: 2, 4, 6, 9, 12 and 15 drops. The drops should be taken on an empty stomach. This is claimed to be a cheap, simple, harmless and active method for treating tuberculosis.—*Das Wesen des Tuberkulins und neue Wege der Tuberkulosebehandlung mit Partigenen, G. Deycke, Ztschr. f. Tuberk., May, 1924, xl, 161.*—(*H. J. C.*)

Dreyer's Vaccine in Treatment of Tuberculosis in Guinea Pigs.—Dreyer has recently reported promising therapeutic results from the use of "defatted" tubercle bacilli in experimental tuberculosis. However, his experiments included only a few animals, and the infection with which he dealt was of a decidedly mild type, possibly permitting spontaneous recovery in some instances. Hence, it was considered desirable to repeat this work. The antigen or vaccine was prepared from tubercle bacilli (Ravenel) according to the method of Dreyer. This consists essentially in hardening the bacilli in formalin and then extracting in hot acetone. This alternate treatment is repeated until the bacilli have been rendered non-acid-fast. The bacilli are then made up in suspension so that 1 cc. of the final dilution contains 0.2 mgm. of bacterial substance. Four series of guinea pigs were used in the experiment. *Series 1* consisted of 99 animals. These were inoculated subcutaneously with tubercle bacilli (Ravenel), so that each pig received approximately 0.1 mgm. of bacteria. The animals thus inoculated were divided into four groups. In groups A treatment with the antigen was begun three days after inoculation, in group B two weeks after, in group C four weeks after, and group D received no antigen and served as controls. The treatment with the antigen, once started, was repeated once or twice weekly over a period of about ten weeks, the dose consisting of 0.5 cc. of the antigen. No local or general reactions were observed following the injections. Contrary to the findings of Dreyer, the treated pigs did not live as long as the untreated, the effort of treatment being apparently to accelerate the fatal issue rather than to delay it. In *series 2* an attempt was made to immunize guinea pigs before infection. Twenty animals (group F) received 5 injections of the antigen in the course of seventeen days. These, together with 56 un-

treated animals were then inoculated with living tubercle bacilli (Ravenel), each animal receiving 0.05 mgm. subcutaneously. The untreated animals were separated into three groups. In the first group (G) treatment with the antigen was begun nine days after infection, and the last group (I) received no treatment. The group treated before inoculation (F) also received treatment after inoculation. All treatments were discontinued six weeks after infection. At the time of writing, as far as the individual groups are concerned, group F shows 53 per cent mortality; group G, 75 per cent; group H, 40 per cent; and group I (control), 46 per cent. Upon considering the foregoing results, it seemed possible that the test of resistance to which the animals were subjected was too severe. Hence, in the two final series, the tubercle bacilli were administered in lessened amounts and without trauma. In *series* 3 the test animals were exposed to cage infection. Ten guinea pigs, having received 15 preliminary injections of Dreyer's antigen, with 8 normal controls of similar weight, were housed in a large cage with many frankly tuberculous guinea pigs. Nine months later, two of the control animals were dead of tuberculosis. Those still living showed slight adenopathy. Of the 10 immunized animals, 5 were dead of tuberculosis, and the remaining 5 showed palpable adenopathies. In the last series (4) infection was brought about through the conjunctival route. Five guinea pigs received 12 preliminary injections of Dreyer's antigen and four received 7 preliminary injections of bacilli, defatted by the method of Fornet. About one month after the last treatment, 0.02 mgm. of tubercle bacilli in suspension were dropped into one conjunctival sac of each of the above animals, and of 4 normal animals (controls) with due precautions to avoid trauma. To date, the animals treated with Dreyer's antigen show 80 per cent deaths, and the Fornet antigen-treated and the untreated animals each 25 per cent deaths. Treatment with the Dreyer's antigen seems to contribute to the early development and rapid progress of infection as compared with the controls. *Conclusions:* The results of the foregoing experiments show clearly that Dreyer's vaccine does not confer resistance to tuberculosis in guinea pigs when employed either as a prophylactic or as a curative agent. A study of the mortality curves indicates that the treatment probably diminishes the resistance to infection, for the animals treated with the vaccine tend in general to develop lesions more quickly and to die earlier than the controls.—*The Influence of the "Diaplyte" Antigen of Dreyer on Tuberculosis of the Guinea Pig, J. J. Bronfenbrenner and E. S. Straub, J. Exper., M., February 1, 1925, xli, 257.—(J. S. W.)*

Ectotuberculin.—Even though ectotoxin and endotoxin of tubercle bacilli occasion the same tissue changes, the substances need not be identical and the biological effects can be different also. An attempt was made to produce a pure ecotoxin, and this was possible when not too old (3 to 4 weeks) cultures were used and special attention paid to keeping the bacilli on the surface and from entering the depths of the medium, thus avoiding the freeing of the soluble constituents (endotoxins) of the dead bacilli. Ectotuberculin is the bacillus-free culture medium of young bouillon cultures. O. T. is probably a mixture of ectotoxins and extractable endotoxins. After removing the ectotuberculin the bacillary residue was used for preparing endotuberculins. After intracutaneous injection of ectotuberculin there was obtained the "abacillary ectotuberculosis of the skin" with local and focal reactions, and in addition general reactions with high fever. The objective sought was not attained, since the refractory substances did not give the desired reaction after intracutaneous injection, although inflammatory focal reactions were obtained, with a definite tendency to healing. In how far ectotuberculin has therapeutic value remains for the future to determine.—*Ektotuberkulin, A. Jesionek, Ztschr. f. Tuberk., April, 1924, xl, 1.—(H. J. C.)*

Curative Effect of Ectotuberculin.—Ectotuberkulin is a filtrate glycerine-broth culture of tubercle bacilli four or five weeks old. Repeated intracutaneous and subcutaneous injections of this product in persons with tuberculosis of the skin produce healing by setting up necrosis of the foci, sloughing and resolution. There is marked hyperemia, and serous or seropurulent exudate of the skin foci occurs after injection; the temperature rises to 104°F., lasts ten to twelve hours after injection and returns to normal after another twelve hours. Explanations of the process of cure in tuberculosis are unsatisfactory. In this disease we have to deal with biochemical processes in the focus which go on between the interior of the focus and the connective tissue, rendering the latter in a condition in which it is absorbable. If the connective tissue has been absorbed, the tuberculous process has reached its end and the disease progresses. If this tissue survives, many epithelioid

cells—daughter cells of the connective tissue cells—are formed. These are stimulated to proliferation by the poison, and it is the old connective tissue that is largely subject to the dissolving effect of the poison. Of these poisons there are three: (1) ectotoxin, a product of bacillary metabolism, (2) endotuberculin, extracted from bacilli by heat, and (3) endotoxin, remaining after prolonged extraction with heat. So three tuberculin preparations are made. The injection of boiled tubercle bacilli produces no reaction. But a second injection of the product brings out a reaction. An injection of ectotuberculin will also bring out a reaction after a previous dose of boiled tubercle bacilli. Ectotuberculin has an affinity for embryonic connective tissue cells, and prevents the deleterious effect of the toxin of the tubercle bacillus.—*Die Heilwirkung des Ektotuberkulins, A. Jesionek, Deutsche med. Wchnschr., January 2, 9 and 16, 1924, li, 8, 60 and 102.*—(*H. S. W.*)

Treatment of Pulmonary Tuberculosis by "Angiolymph."—Another "cure" for tuberculosis for which great claims have been made has been tried out on 12 patients. Aside from some euphoria and one or two instances of "suggestion improvement," no results either good or bad were observed. The patients treated included slight, moderately severe and severe cases of tuberculosis.—*Zur Behandlung der Lungentuberkulose mit "Angiolymphe," E. Ladeck, Wien. klin. Wchnschr., July 24, 1924, xxxvii, 739.*—(*H. S. W.*)

Experimental Chemotherapy of Tuberculosis.—After entirely negative results with malachite green and methylene blue, contrary to Linden's findings the author finally succeeded in obtaining a diffuse blue stain of the tuberculous focus, including the necrotic centre, by means of the subcutaneous injection of a vital blue dyestuff which was given in 5 cc. dosage of a saturated solution on five successive days. Microscopically, the dye was taken up by the leucocytes, round cells, and endothelial and epithelioid cells. By pushing the administration of this nontoxic dye all of the tissues, with the exception of muscle fibres, showed dye-stained granules. Therapeutic experiments on tuberculous guinea pigs with various chemical substances, including *Lecutyl* ointment, methylene blue, colloidal gold, silver, colloidal silver, copper and colloidal copper preparations, dimethylglycocoll-copper solution of Linden, *Yatren*, gold preparations of Bayer & Company, and silistren all proved negative.—*Die experimentellen Grundlagen moderner Tuberkulosetherapie, T. J. Bürgers, Beitr. z. Klin. d. Tuberk., 1923, lvii, 209.*—(*H. J. C.*)

Gold Treatment of Tuberculosis.—Since Koch's discovery of the high bactericidal power of gold salts for tubercle bacilli, numerous attempts have been made to make gold more suitable for therapeutic use by reducing its toxicity for man. Spiess and Feldt achieved considerable reduction in toxicity by synthesizing it with organic compounds. Krysolgan was an improvement on their original product, *aurocantan*, in respect to toxicity; nevertheless, numerous untoward results from the use of krysolgan are on record. *Triphal* is a new gold compound, more stable than krysolgan and only half as toxic for warm-blooded animals. A year's experience with *Triphal* leads Rickmann to the conclusion that it stimulates the formation of granulation tissue, and is especially useful in laryngeal tuberculosis. Rickmann has been chiefly concerned with the indications for gold treatment in tuberculosis of the larynx. Apparently, as in X-ray therapy, certain types do well and others do not. Cases with a well-defined tendency to connective tissue formation are most suitable, while exudative, destructive processes are made worse.—*Beitrag zur Goldbehandlung der Tuberkulose, L. Rickmann, München. med. Wchnschr., November 14, 1924, lxxi, 1609.*—(*E. R. L.*)

Sanocrysin Treatment of Pulmonary Tuberculosis.—Since the end of April, 1924, Moellgaard's sanocrysin has been in use at Vejlefjord Sanatorium, and at the present time (January, 1925) the experience is based on 61 cases of pulmonary tuberculosis. In 44 cases the treatment has been completed, while 17 patients are still undergoing it. Moellgaard is right in saying that complications incident to the use of the drug are due to its specificity in causing a dissolution of bacilli, and the subsequent liberation of endotoxins. Besides this, there are other effects, which apparently have been overlooked, attributable to the toxicity of the metallic salt. Before using sanocrysin it is necessary to be familiar with the bio-immune conditions of the different types of tuberculosis, to determine the state of immunity in each case, and to anticipate as far as possible the probable effect of a liberation of endotoxins. As an antidote against toxemia sanocrysin is used together with an antiserum prepared from animals injected with an emulsion of defatted bacilli. This serum has a certain protecting power but it does not nearly neutralize all risks. It counteracts the greatest danger, namely, tuberculin shock. It may in some degree improve the resistance

to toxemia but it does not transform all "impracticable" into "practicable" cases. Even slight manifestations, such as albuminuria, may be slow in clearing up in spite of abundant application of the serum, and severe symptoms such as anorexia, nausea, vomiting, diarrhea, loss of weight and exanthemata do not usually react beneficially to its use; such symptoms may actually be increased. Anaphylactic reactions have been observed in spite of precautionary desensitization. In case of focal reactions the serum is often ineffective. Finally, the serum seems to be powerless against cachexia, whether previously present or produced by treatment. Until a more effective serum is found the present serum must be used extensively with sanocrysin. *Special indications:* The character of the disease is more important than its extent in selecting cases for treatment. All clinical means must be used in forming a qualitative diagnosis, and to this end X-ray examination affords special help. Because of the accompanying hyperemia and intimate connection with the blood stream, exudative foci are more susceptible to the action of the circulating sterilizing agent than are those protected behind a more or less bloodless, fibrotic tissue of the proliferating type. Recent exudative types are, therefore, considered more suitable for treatment. In mixed types the effect depends on the predominating character of the lesions: exudative deposits, which influence prognosis unfavorably may yield to the drug, and thus further progress of the disease is halted, and subsequent additional treatment, conservative or surgical may be more successful. When large cavities are present and morbid anatomical changes have proceeded beyond the stage of repair, a condition is present which offers an insuperable resistance to effective arrest. In such cases the effect of sanocrysin on accessible foci may be supplemented by the different methods of collapse therapy, the two procedures being thus mutually improved in effectiveness. Sanocrysin is not to be used as a matter of blind routine. The risks attached to its use and its disagreeable side issues make it necessary, when choosing the cases, to demand that there should be a real prospect of such benefit as could not be obtained by ordinary means. Especially is there every reason for reserve in cases that empricially have a good or fair prognosis when treated on ordinary hygienic lines. Economic, social and other special circumstances must be weighed. *Method of Treatment:* Sanocrysin must be given according to particular characteristics in the individual case. The rule is to give it and the serum in such a way as to have the strongest possible concentration of the specific in the blood that can be tolerated with safety, and to maintain this concentration for the time necessary to produce the full desired effect. The greater the amount of the toxins circulating in the body, the smaller is the amount of sanocrysin and the larger the amount of antiserum employed. In chronic toxemia due to less virulent infection a state of cachexia contraindicates the treatment. If, on the other hand, the toxic condition is more acute, caused by a malignant and rapid infection, when the antigen is still actively working, a hectic condition is present which may permit careful treatment with an ample amount of serum injected prophylactically together with the sanocrysin; or the serum may be given some days beforehand. Further treatment must be very carefully controlled with special attention to any initial signs of shock. More satisfactory conditions for treatment are those in which there is more or less of a balance between toxins and antitoxins in the body, because tolerance may then be expected. Tolerance to liberated toxins increases in the following order of conditions: (1) good immunity maintained against a virulent type of infection; (2) low immunity and low virulence; and (3) high immunity and low virulence. In the last combination sanocrysin administration may be continued sufficiently long, while the serum often can be reduced in amount or eliminated. In difficult cases smaller doses than ordinarily recommended have been used, and in a few cases the initial dose has been as low as 12.5 cgm. of sanocrysin or less than 0.25 cgm. per kg. body weight. Subsequent doses are slowly increased. When the anticipated tolerance is higher the initial dose is 50 to 75 cgm. or about 1 cgm. per kg. body weight. Further dosage is similarly arranged according to the tolerance estimated previous to each injection. Each subsequent dose may be increased by 25, 50 or 100 per cent of the previous one, and the intervals are made longer or shorter, two, four, six or more days, in proportion to the general condition of the patient. The maximum therapeutic dose is about 2 cgm. per kg. body weight. When this is reached an interval of at least four to six days is allowed, this being the period during which the drug remains circulating in the blood. Usually the plan of administration must be modified when intercurrent compliations appear. As long as any noteworthy reaction symptoms persist the next dose is kept in abeyance. The temperature must return to its usual height, and exanthemata or albuminuria must have practically disappeared before another injection is given. The ultimate aim, when attainable is to arrive at a point of treatment where full

chemotherapeutic doses, without assistance of serum, cease to cause any tuberculotoxic reaction. Often bacilli persist in the sputum when a negative reaction to the injections has been obtained; even then improvement may be evident, and later the bacilli may disappear after a further course of sanocrysin injections. The duration of treatment varies from a very short period to several months. Two temperature curves and reproductions of X-rays of 3 cases showing changes during treatment are included. *Complications:* Fatal tuberculin shock was not encountered. As a routine a hypodermic of caffein solution is given, when administering the sanocrysin, to stimulate the heart against shock. Other complications are due to general or focal reactions, or to metallic poisoning. The general reaction includes fever, exanthema, anorexia, nausea, diarrhea and albuminuria. Permanent consequences were seen in only a few cases and include chronic enteritis and one case of chronic jaundice. Focal reactions are responsible for the severest complications. These may be temporary, followed by a tendency to healing, but in other cases they lead to a more permanent activation of the disease. One patient developed a rapidly fatal pneumonic condition. Extrapulmonary focal reactions were seen in lymph nodes and elsewhere. Intestinal hemorrhage occurred in one case, and, in another, reactivation of a tuberculous peritonitis complicated by serofibrinous pleurisy. Symptoms of metallic poisoning include colitis, stomatitis, desquamating dermatitis and albuminuria. *Results of treatment:* Forty-four cases are classified; in 22 the results were positive, and in 22 negative. Under positive results, 3 patients were classified as apparently cured (bacilli disappeared from sputum, all subjective symptoms subsided, objective signs indicated real healing); 7 were much improved (disease inactive, no reaction to further doses of sanocrysin, improvement in general and local symptoms, bacilli disappeared in only a few cases); 12 were improved (decrease of active disease, better prognosis after treatment, bacilli still present in sputum). In the negative group 8 were classified as stationary; 3 stationary, since dead; 3 worse; 8 worse, since dead. In the last 8 cases death was apparently hastened by the treatment. Two cases of miliary tuberculosis were treated without benefit. Two cases of pleurisy were treated, but the indications for sanocrysin in such cases are doubtful. Two cases of fistulous bone tuberculosis were treated by injecting sanocrysin locally into the sinuses: in one case apparently solid healing occurred; in the other, no benefit. The author's chief conclusions are quoted as follows: "To sum up my impression on the use of the new remedy, I am convinced that we have in sanocrysin a real chemo-specific with an action, hitherto unknown in tuberculosis, upon certain suitably selected cases; on account of its very specificity its clinical utilization necessitates a careful administration and great selective discrimination until points at present obscure can be brought to light. Experiences seem to me to justify the claim that this treatment should, for the time being, be considered a special task for sanatorium and tuberculosis clinicians if its full benefit is to be attained. If our sanatoriums were to change their character and were to develop more along the line of hospitals, this is one of the ways in which development would take place. It has already been shown that such change of traditions and equipments harmonizes well with the original ideas of sanatorium regimen, as the principles of hygienic and dietetic nature are still, and probably always will be, of great additional benefit to any special or specific treatment of tuberculosis."—*Sanocrysin Treatment in Pulmonary Tuberculosis, J. Gravesen, Tubercle, March, 1925, vi, 265.—(J. B. A.)*

Theoretical Basis of Sanocrysin Treatment.—This treatment represents an attempt to build up a chemotherapy in the sense of Ehrlich and Morgenroth; it is, however, a beginning only. In using any chemical substance the rate of parasitotropy to organotropy decides the question of its applicability as a therapeutic agent. Every injection of such a substance into the blood of any human being, therefore, always implies some risk. Chemotherapy means not only bactericidal treatment, but also the production of immunity indirectly through the action of liberated antigen. If this antigen is very toxic, its liberation may result in serious or fatal reactions. The tendency, therefore, is to reduce the dose of the bactericidal substance, but this may prove entirely ineffective therapeutically, or may even stimulate the disease. The alternative is to employ combined chemotherapy and serotherapeutic treatment. The development of certain phases of chemotherapy (especially with the heavy metals) in tuberculosis is discussed. *Chemistry of sanocrysin treatment:* The first step in diminishing the organotropy of any compounds of a heavy metal is to enclose the metal in a real complex body, not in itself poisonous to the organism, of which the stability is sufficient to keep the concentration of metallic ions in watery solution practically equal to zero. The whole complex must have such chemical qualities that the amount of it which does

not enter into combination with the parasite is excreted unaltered, or, if decomposed, then without the forming of metallic ions or other bodies poisonous to the organism. To secure a bactericidal effect the substance needs further a specific affinity for the parasite in question. In addition, in tuberculosis, the substance can be effective only in so far as it is capable of penetrating the resistant fatty system of the bacillus. Because of the avascularity of tuberculous lesions this substance must also diffuse very quickly through animal membranes and be sufficiently stable in the body to be kept unaltered in the blood and lymph for a relatively long time. These last considerations led to the idea that if a substance is to influence tubercle bacilli in the body, its bactericidal effect must be carried by a rapidly-moving (negatively charged) ion of high stability. Hence, the fundamental idea in the chemical theory of sanocrysin is to insert the heavy metal into a real complex, which is a rapidly-travelling negatively-charged ion with sufficient stability to remain unaltered in the body for a relatively long time. The heavy metal carried by the sanocrysin ion is gold, because of its greater influence on tubercle bacilli in culture than any other metal. Sanocrysin has a special affinity for the bacilli and is able to carry the gold through the lipoid system into their bodies. The therapeutic agent of sanocrysin is the complex negatively-charged ion AuS_2O_3. This ion has the following properties: 1. It is easily soluble in water. 2. It is a real complex and of real stability. 3. It is rapidly diffusible. 4. It remains in the body for four to six days after injection into the blood. 5. It is partly decomposed in the body, evidently yielding metallic gold, and partly excreted principally by the kidneys in complex condition. 6. It does not precipitate proteins, especially not the proteins of calf or horse serum, at a temperature of 38° to 40°C. 7. It penetrates the lipoid system of tubercle bacilli in a very short time, affecting the acid-fastness very gravely, and carrying gold into the body of the bacilli in amounts which after a short time can be shown by microchemical reaction. 8. It prevents the growth of tubercle bacilli in culture. On a medium containing no peptone the growth-limiting concentration is 1 in 100,000. This value is probably altered in other media. All media containing H_2S will decompose the sanocrysin and precipitate the gold as gold sulphate and metallic gold. In such media the growth-preventing concentration will increase. *Pharmacology of sanocrysin:* The organotropy of sanocrysin has not been cleared up in all its details. However, from investigations (details are given) it appears that the drug in doses of from 1 to 4 cgm. per kg. of body weight has very little effect on the sound body. The action on the kidneys (albuminuria) is avoided when the initial dose does not exceed 1 cgm. per kg. nor the maximum therapeutic dose 2 cgm. per kg. Most animals and a large number of human beings endure bigger doses. The effect on the kidneys seems to be quickly reparable, and even with doses up to 6 cgm. the albuminuria disappeared in a few days. No chronic nephritis was found in calves even after six months' observation. *Immunobiological principles:* It is to be expected that a chemical compound which kills tubercle bacilli in the body will cause very serious toxemia when injected into a tuberculous subject. This injection may involve all the risks of tuberculin shock, or, at any rate, of "tuberculous reaction." On the other hand, a chemical substance which is not capable of producing tuberculin reactions cannot be expected, when injected into tuberculous bodies not immune from tuberculin, to have any injurious influence on the tubercle bacilli. A curative effect must, therefore, be associated with big reactions; and this seems to be true of sanocrysin, since a quarter, and in some cases one-tenth, of the dose which is without effect on the healthy animals produces the most severe reactions in the tuberculous organism. *Shock produced by sanocrysin:* One-third of the sanocrysin dose which is tolerated by the healthy guinea pig always produces very severe intoxication in the highly tuberculous guinea pig, and usually kills the animal in sixteen to forty-eight hours. The pathological changes are identical with those found in the tuberculous guinea pig killed by tuberculin. The same phenomena were observed in goats, calves and monkeys. Individual variations are described. *Serotherapy of sanocrysin shock:* Investigation of 30 large tuberculous animals treated with sanocrysin showed that the shock occurred mainly during two distinct periods; namely, during the first three weeks after the artificial infection, and during the last weeks before death. Knowing that measurable antibodies in the blood are diminished, if not totally absent, in these two periods, it was concluded that animals in the more chronic period might contain antibodies which were capable of protecting them from shock. To test this, serum from a calf, affected with chronic tuberculosis for about three months, was injected intravenously into two tuberculous calves suffering from grave shock produced by a sanocrysin injection. The result was striking; these calves recovered clinically in a few hours, and the albuminuria disappeared

in twenty-four hours. From this observation it was concluded that it might be possible to immunize animals against shock; this would have to be a passive immunization, that is, by way of serotherapy. This serum was first produced in calves by repeated injections of killed tubercle bacilli and tuberculin. At present it is made by injection of defatted, formalin-treated tubercle bacilli, according to Dryer's principle. By means of this antigen the strength of this serum has been increased, and it has been possible to make it in horses. With this serum 40 tuberculous calves and goats, suffering from albuminuria after sanocrysin injection, have been treated on more than 120 occasions. In all cases in which the infection has been moderate the albuminuria has disappeared, usually quickly but sometimes more slowly, and the shock was prevented. Shock was not prevented in animals infected with more than 7 cgm. of virulent tubercle bacilli injected intravenously. In calves, monkeys and human beings the serum cures the shock when injected intravenously in sufficient doses at the very beginning of the fall in temperature. If, however, the collapse has continued for any considerable time, the serum injection, may be followed by temporary recovery, but death ensues from failure of the heart. In clinical treatment it should, therefore always be the rule to inject serum at the earliest appearance of the albuminuria, as it is the first sign of impending shock. Albuminuria is not on every occasion followed by shock, but it is not always possible to decide in a given case whether or not this will happen. *Reactions of the tuberculous organism immune to the shock:* Animals or patients with more chronic tuberculosis often tolerate sanocrysin without signs of shock. In such cases or in those made immune by serum a different type of reaction is noted, belonging to the group of "tuberculous reactions." These include rise in temperature, exanthemata, loss in weight, faintness and intestinal disturbances. Also, focal reactions in the infected organs are observed with more or less regularity, as happened with tuberculin injections. *Loss of reaction during treatment:* All reactions disappear gradually as the clinical signs of the disease disappear. Pathologically, however, conditions in tuberculosis are so complicated that the loss of all reactions to sanocrysin is no decisive proof of a real cure. Animal experiments show that the condition of failing reactions to sanocrysin means one of three things: 1. Sterilization until negative result of the guinea-pig test. 2. Total immunity with loss of Pirquet reaction, but without sterilization. 3. Simple failure of of reactions because the rest of the bacilli are too protected by fibrous tissue or lime; in these cases the Pirquet reaction persists. Whether there is a fourth possibility, that of a gold-fastness of the bacilli, we do not know at present. Before their total disappearance the reactions to sanocrysin are ordinarily delayed until two or three days after injection; this is in close accord with the power of sanocrysin to remain for four days in the body and to diffuse through animal membranes. The late reactions are explained on the assumption that most of the bacilli have been cleared out, and those remaining are better protected; the substance, therefore, takes longer to reach the bacilli by diffusion. In order to avoid a cumulative effect of the substance, and if there are no special indications which make a more intensive treatment necessary, the interval between two injections of 2 cgm. of sanocrysin per kg. of body weight should never be shorter than four days. For the same reason it is not right to inject a fresh dose of sanocrysin during the temperature reaction produced by a previous injection. *Curative results:* While the combined sanocrysin-serum treatment has induced healing of tuberculosis in goats, calves and monkeys, it appears that thorough sterilization of the affected organs is very difficult, and probably very seldom secured in cases of grave infections. Curative results have been obtained mostly in cases of the exudative pneumonic type of tuberculosis of the lungs. Further, the possibility of achieving sterilization seems to depend to some extent on whether or not the disease has progressed as far as caseous destruction. These conditions must, therefore, be expected to apply also in the human subject. It is possible in a short time to cause typical productive tuberculosis in its earliest stages to heal with sclerosis and calcification, and clinical experience has shown that cases of acute extensive miliary tuberculosis of the lungs can be brought into a condition of clinical healing. In most cases productive and exudative processes are found together, and the sanocrysin will then have a great mission in checking the exudative progressive processes. The extent and gravity of the tuberculous process set a certain limit for the success of the sanocrysin treatment. In calves and goats this limit is with an initial infection exceeding 7 cgm. tubercle bacilli (of the cultures employed by the author) per 100 kg. live weight. This limit is not decisive but dependant on the virulence of the cultures employed, when the treatment begins at the same time after the date of infection. Mixed infections in the lungs

interfere with the curative effects. *Fate of tubercle bacilli in the tissues and alterations in the tuberculous lesions:* In 3 cases the lungs of calves have been examined after two to four weeks' sanocrysin-serum treatment. Microscopic examinations of preparations stained by the Ziehl-Neelsen method showed, particularly in small remaining miliary tubercles and their surroundings, numerous acid-fast granulations mixed with curled acid-fast and grey non-acid-fast bacilli. Among them were often found some acid-fast bacilli with normal morphology and, as a transitory stage between the normal bacilli and the free granules, chains of granulations in the tissue. The granules were almost all intracellular. Probably these phenomena are indicative of the way the bacilli are cleared out of the tissue under treatment. The influence of the treatment on tuberculous lesions varies according to the presence or absence of caseation. When the process has been treated in the pneumonic exudative stage the only residual found on microscopic examination seem to be obliterated capillaries and small vessels and some infiltrations of the alveolar walls which, however, are also found in the lungs of normal calves. When real miliary tubercles and bigger caseous tubercles have developed the alterations are similar to those occurring in spontaneous healing, namely, sclerosis and calcification. Miliary tubercles may be grown through with fibrous tissue and contain a stone-hard piece of lime after four and a half to ten weeks' treatment. Bigger caseous tubercles have often in a very short time (five weeks) become surrounded by thick fibrous walls, and more or less filled with pieces of lime.—*The Theoretical Basis of the Sanocrysin Treatment of Tuberculosis, H. Moellgaard, Brit. M. J., April 4, 1925, no. 3353., 643.*—(*J. B. A.*)

Sanocrysin.—It is regrettable that the new gold cure introduced by Möllgaard should have had such wide publicity in the daily papers before a scientific basis for the claims has been established. Möllgaard must prove yet that his remedy will kill tubercle bacilli in the living animal. Besides this, there is room for grave doubt about the efficacy of the immune serum that is made so much of in the claims. The entire procedure is unrefined, not yet worked out, and dangerous. It is as a two-edged sword to the patient. The technique of administration has not been established and the entire procedure is open to great criticism. It is only in its experimental beginnings at best and should not be thought of as a usable scheme by the practicing physician.—*Die Möllgaardsche Behandlung der Tuberkulose mit "Sanokrysin," Bacmeister, Deutsche med. Wchnschr., January 30, 1925, li, 184.*—(*H. S. W.*)

Krysolgan and Tuberculosis Problem.—In summarized form the development of the gold treatment for tuberculosis is given, especially the origin and the pharmacologic action of Krysolgan and the mechanism of the action of chemical agents in chronic infectious diseases as a whole and particularly that of gold in tuberculosis. The view of Heubner that acute lethal doses of gold have a primary paralyzing effect on the capillaries of the entire body, especially those of the digestive tract, is incorrect. Gold, like other metals used for therapeusis, acts as a catalyser in the body, and by primarily altering the body colloids, occasions the formation of inflammatory irritants from substances originating from body proteins. The ferment-like property of the gold counteracts the irritating substances (to which tuberculin also belongs), which act on tuberculous tissue and accelerate the autolytic processes in the foci of disease, and result in a flooding of the body with toxic, cellular disintegration products. Gold and tuberculin, therefore, occasion closely related processes; a catalytic action is also expressed by the fact that even small doses cause characteristic focal and general reactions in the tuberculous body. Besides these, other substances (iodine, antipyretics, salvarsan, mercury, protein bodies, etc.) can exert an irritating action on tuberculous tissues, but gold, and especially krysolgan, has the property, in contrast to tuberculin, of limiting the inflammation around the tuberculous focus. This demarcating influence depends upon the fact that krysolgan can decompose the liberated toxic cellular decomposition products, and also that it has an inhibiting action on the mobilized tubercle bacilli which have reached the blood and lymph. It is not believed that a true tuberculosis parasitotrope of chemical nature will be found, because of difficulty in penetrating the fibrous capsule. Krysolgan action is analogous to the nosotropic action of the heavy metals (mercury and bismuth) on syphilitic granulation tissues, in which case there is a hastening of autolytic processes without any direct influence on the spirochete. In distinction to this, the etiotropic salvarsan rapidly causes the disappearance of the causative organism, which is possible only because syphilitic granulation tissues, in distinction to the tuberculous tissues, are well vascularized.—*Krysolgan und Tuber-*

kuloseprobleme, A. Feldt, Beitr. z. Klin. d. k. Tuber., 1924, lvii, 269.—(H. J. C.)

Iodine Treatment of Surgical Tuberculosis.—Iodine treatment in healthy as well as tuberculous subjects occasions a relative lymphocytosis. The tuberculin-detoxicating action of iodine also plays a rôle. Only four times was an iodine intoxication associated with increased pulse and delirium noted. It can occur with small doses and is due to individual idiosyncracy. Increase in pulse-rate over 110 is an index to discontinue treatment. Permanent harm was never noted. One to four cubic centimetres of iod-iodoform solution (iodoform glycerine 10 per cent, 10 gm., to iodine 10 per cent, 90 gm.) are injected in 2–4 weeks, and to obviate the pain of injection the latter is preceded by an injection of 2 per cent novocain solution.—*Zur Iodbehandlung der chirurgischen Tuberkulose, G. Hotz, Centralbl. f. Chir., 1924, li, 826.—(H. J. C.)*

Ethyl-Chaulmoogric and Ethyl-Morrhuic Ethers in Treatment of Pulmonary Tuberculosis.—During the past two years various chaulmoogra derivatives have been tried in pulmonary tuberculosis by the authors. The gynocardates and morrhuates of sodium for subcutaneous injection have had to be abandoned because of the severe reactions which they produce. After various trials a mixed chaulmoogro-morrhuic ether, dissolved in codliver oil with 2 per cent cholesterin, was employed. This forms a limpid, mahogany-clear, oily liquid, of a penetrating and aromatic odor, which is easily injectable. Three cubic centimetres of a one in three solution are injected into the gluteal muscles twice a week. The injections are painless and cause no reaction. During more than a year a large number of tuberculosis patients, with unfavorable prognoses, were treated without appreciable benefit. For six months 20 patients with severe bilateral fibrocaseous lesions were treated without accident. All showed a more or less noteworthy improvement. The results are encouraging but too recent to warrant drawing conclusions.—*Les éthers éthyl-chaulmoogriques et éthyl-morrhuiques dans le traitement de la tuberculose pulmonaire, J. Pernet, M. Minvielle and M. Pomaret, Meeting, Soc. Méd. des Hôp. de Paris, January 9, 1925, reported in Presse Méd., January 14, 1925, no. 4, 55.—(J. B. A.)*

Ethyl Morrhuate in Tuberculosis.—Sodium morrhuate, recommended by Rogers for the treatment of tuberculosis and given subcutaneously in 3 per cent solution, is an unstable substance, which cannot be used in freshly prepared solution and which causes violent local, general and focal reactions. The substitution of the ethylic ether of morrhuic acid is proposed: this is a perfectly pure product, stable in oily solution, and gives rise to less severe reaction. Its solubility in oil renders it more usable, and it can thus be injected intratracheally or hypodermically. The tracheal route is apparently preferable. The lethal dose of ethyl morrhuate is very large, about 1.5 cc. of the pure product per kilo of animal. Its cardiotonic property is a valuable feature in consumptives.—*Le morrhuate d'éthyl dans le traitement de la tuberculose, A. Grigant and A. Tardieu, meeting, Soc. de. Thérapeutique, December 10, 1924, reported in Presse Méd., December 20, 1924, no. 102, 1022.—(J. B. A.)*

Sodium Morrhuate in Tuberculosis.—This drug, which is a sodium salt of codliver oil, was introduced some years ago by Rogers for the treatment of tuberculosis. Seventeen chronic or advanced cases received treatment with sodium morrhuate at the Peel Hall Pulmonary Hospital from September 1 to November 7, 1924. The preparation consisted of a 3 per cent sterilized solution in ampules, and was given subcutaneously, usually twice a week, and toward the end of the course once a week. The dosage was 0.1 cc. gradually increasing to 0.9 cc. A local reaction was frequently seen as slight to moderate redness with occasionally some local superficial necrosis. This occurred usually in cases with obviously poor resistance. Injections were not given to patients with marked fever, and when fever (over 100°F.) occurred during the course of treatment, either as a result of the injections or independently, the injections were stopped until the fever subsided. The number of injections per case ranged from 5 to 13. Patients who received the greatest number of injections also received the largest doses toward the end of their course of treatment. On comparing the results obtained in the treated group with the condition of the remainder of the patients in the hospital who received similar treatment except for the absence of injections, it is concluded that subcutaneous injections of a 3 per cent solution of sodium morrhuate in the doses stated had no material influence upon the course of tuberculosis in its chronic or advanced stages.—*Sodium Morrhuate in Pulmonary Tuberculosis, G. Jessel, Tubercle, February, 1925, vi, 223.—(J. S. W.)*

Comparative Effects of Ethyl Morrhuate and Sodium Morrhuate.—Studies were made of lesions caused by (1) tracheal injection of 5 cc. of ethyl

morrhuate in dogs; (2) massive intravenous injections of ethyl morrhuate in rabbits; and (3) intravenous injections of sodium morrhuate and of ethyl morrhuate, for comparison, in two dogs. The animals were killed in from twelve hours to fifteen days afterward, so that the tissue changes observed were relatively early. The following conclusions were formed: Tracheal injection sets up only a benign bronchiolar reaction, apparently with participation of the lymphatics. The pulmonary lesions secondary to the injection of sodium morrhuate consist of a very pronounced necrobiosis, with discrete thrombosis not causing complete obliteration of the lumen of the vessels. The injection of ethyl morrhuate, on the contrary, produces wholly different lesions characterized by a predominating thrombosis and a few minimal and circumscribed epithelial lesions (desquamation and swelling), strictly localized around the thrombi. These lesions do not seem to be specific for either of the medicaments used; the changes are explained largely by the chemical nature of the injected product, sodium morrhuate being a soap, while ethyl morrhuate is an oil. These observations demonstrate that ethyl morrhuate, which is easily employed, does not cause the destructive pulmonary lesions which are provoked by massive doses of sodium morrhuate.—*Étude experimentale des morrhuates d'éthyle et de soude, G. Caussade, A. Tardieu and A. Grigant, Meeting, Soc. Méd. des Hôp. de Paris, January 9, 1925, reported in Presse Méd., January 14, 1925, no. 4, 55.*—(*J. B. A.*)

Lipoid Treatment of Tuberculosis.—In the belief that the body in some cases reacts more easily to ordinary than to specific lipoids, and that the lipoid antibodies are closely related, children from the second-stage class, Ranke, having lymphatic tuberculosis, were treated subcutaneously with lecithin. The results of a nonspecific lipoid treatment is evaluated according to the increase of specific antibodies toward *F* and *N*. All the children gave a skin reaction to lecithin before treatment, which is believed to be an index of the presence of antilipoid. The hoped for increase in the titre toward *F* and *N* was not obtained, which does not necessarily discredit the value of this method of treatment but indicates a high initial allergy only.—*Unabgestimmte Lipoidbehandlung, H. Much and K. Brünecke, Beitr. z. Klin. d. Tuberk., 1924, lviii, 258.*—(*H. J. C.*)

Salvarsan in Tuberculosis Complicated by Syphilis.—Salvarsan should always be used in cases of fibrotic-proliferative and pure proliferative pulmonary tuberculosis complicated with syphilis. In these the treatment had a very favorable influence on general well-being, temperature, body weight and pulmonary findings. Salvarsan should not be used in syphilitics with exudative pulmonary tuberculosis. The favorable effect of this agent is to be attributed primarily to its specific action upon the syphilis, but the favorable action of arsenic on the tuberculosis, in the sense of its being an irritant remedy, is also to be considered.—*Über den Einfluss der Syphilis auf den Verlauf der Tuberkulose, besonders über die Wirkung der Salvarsanbehandlung bei tuberkulösen Syphilitikern, C. J. Raffauf and H. W. Lentrodt, Beitr. z. Klin. d. Tuberk., 1924, lvii, 381.*—(*H. J. C.*)

Treatment of Pulmonary Tuberculosis by Inhalation of Coal, Lime and Silica Dust.—In view of the rare occurrence of tuberculosis among workers in certain dusty trades, especially those in coal, lime and silica, a powder was prepared consisting of 70 per cent calcium, 10 per cent silicic acid, 15 per cent coal and 5 per cent iron oxide and argillaceous earth. To this was added a small amount of tryspin in powder form, in order to dissolve the mucus interfering in the air passages. By means of a dry-inhalation apparatus the powder was inhaled in five to ten deep inhalations daily for 8 days; following this there was a 14-day interval when another 8-day inhalation period was introduced. In a personal experiment the author noticed that this procedure resulted in no harmful effects, except a slight feeling of pressure in the lungs. He recommends it also for the treatment of pure bronchial asthma. Years of experience with this dry inhalation have given excellent results. By means of this "specific scar-tissue stimulant" it is aimed to produce an irritation, and thus encourage connective-tissue formation and healing.—*Die Behandlung der Lungentuberkulose vermittels Einatmung von Kohle, Kalk und Kieselsäure (Trockeninhalation), A. Kühn, Beitr. z. Klin. d. Tuberk., 1924, lvii, 453.*—(*H. J. C.*)

Heliotherapy.—The bactericidal action of solar rays in open surgical wounds was demonstrated in 1917 by Leriche, Sencert, and others. The increased flow of lymph in infected and edematous wounds was described in 1914 by Leo, and has since been confirmed by surgeons using heliotherapy. Aside from local effects, we are now familiar with certain general effects, including gain in weight, improvement of the musculature, increase of appetite, and sedative influences in case of insomnia or pain. The relative values of the various rays of the spectrum

have not been defined absolutely.—*Sur l'heliothérapie, Leo, Meeting, Soc. d'Hydrologie et de Clinatologie Méd. de Paris, January 5, 1925, reported in Presse Méd., January 17, 1925, no. 5, 73.*—(*J. B. A.*)

Ultraviolet Light and Tuberculosis.—In ultraviolet rays, artificially produced, we have a potent remedy against tuberculosis, which is available everywhere and at any time. Cases of pulmonary tuberculosis in the early stages do well, both in children and in adults. In the later stages, when there is much pyrexia and emaciation, the method is contraindicated, or should if used, be administered with the greatest care and discretion. The chief sources of ultraviolet radiation are the carbon-arc lamp, the mercury-vapor lamp, and the tungsten-arc lamp. The carbon-arc lamp is of chief value in institutions where a number of patients must be treated at the same time. There are two chief types, the Reyn model, and the "flaming arc" model after Eidinow. The tungsten-arc lamp is most favored by the author. It is the richest known source of ultraviolet radiation. Too rapid pigmentation is to be avoided, as it is protective against further dosage, and prevents the "provocative reactions" which, if carefully judged, are followed by an increased immunizing response.—*Ultraviolet Rays and the Treatment of Tuberculosis, P. Hall, Brit. J. Tuberc., January, 1925, xix, 21.*—(*B. T. McM.*)

George Bodington.—Among the very first to treat pulmonary tuberculosis on sanatorium lines was, as is well known, the late George Bodington. He was born in Kenilworth Chase, Warwickshire, England. It is not definitely known when he first treated phthisis on open-air principles, but his writings afford conclusive evidence that he was doing so in 1833. In 1840 he published *An Essay on the Treatment and Cure of Pulmonary Consumption on Principles, Natural, Rational and Successful.* He believed the cause of tuberculosis was "nervous irritation, or altered action, or weakened power in the substance of the lungs from the presence of tuberculous matter deposited there, as a foreign body." In condemning certain drugs and gases he stated "the only gas fit for the lungs is the pure atmosphere freely administered without fear; its privation is the most constant and frequent cause to the progress of the disease. To live in and breathe freely the open air, without being deterred by the wind or weather, is one important and essential remedy in arresting its progress—one about which there appears to have generally prevailed a groundless alarm lest the consumptive patient should take cold. Thus one of the essential measures necessary for the cure of this fatal disease is neglected, from the fear of suffering another disease of trifling import." Warm close rooms should be avoided, patients should keep away from fires and maintain the necessary degree of bodily warmth by means of sufficient clothing. Windows must be kept wide open. Nothing is to be gained at the seaside; the inland air is best. The next important indication is a nutritive and moderately stimulating diet. A good glass of sherry or maderia with an egg should be taken in the morning, and another glass of wine after dinner. Riding or carriage exercise must be taken for several hours a day, as also walking for as great a distance as the patient's strength permits, the length of the walk being gradually increased. Inclement weather must not be permitted to interfere with daily walking exercise, riding or driving. Bodington advocated medical men undertaking the treatment of phthisis as a distinct branch of medicine. The best results can be arrived at by the medical man by the reception under his own roof of the consumptive patient. The radicalness of these views is only appreciated by comparing them with the treatment of pulmonary tuberculosis then prevalent. Patients were kept in a room which was provided with double doors and windows, and kept heated by stove heat to a temperature of about 65°. In order to "prevent the deposition or at least the retention of tuberculous matter in the bronchial ramifications and air cells," emetics were given twice a week. Bleeding, cupping and leeching were practised. Pitch plasters, croton oil, the actual cautery, blistering fluid, tartar-emetic ointment, issues and setons, and other counterirritants were employed when considered necessary. Confirmation of Bodington's originality is afforded by the criticisms expressed by the reviewers of his book. His work was not fully appreciated until his death.—*George Bodington, The Pioneer of the Sanatorium Treatment of Pulmonary Tuberculosis, R. J. Cyriax, Brit. J. Tuberc., January, 1925, xix, 1.*—(*B. T. McM.*)

Present Position of Institutional Treatment.—This paper comprises a condensed account of the present position of institutional treatment, using as illustrations the experience in Lancashire, England. In the administrative county of Lancaster, roughly one-fourth of new adult cases are found to be incipient, one-half moderately advanced, and the remaining one-fourth far advanced. In England and Wales there

were 16,095 beds available for pulmonary tuberculosis cases in 1921. In Lancashire the tuberculosis officers periodically visit the hospitals in their areas and confer with the medial superintendents on the following matters: (1) the question of extension of patients' treatment on their return home; (2) The question as to future treatment; and (3) applications for transfers or discharge. The real results of treatment in institutions are the declining death-rate, the declining incidence-rate, and particularly the smaller number of children with pulmonary tuberculosis. So far as comparison is possible, patients in the early and intermediate stages of the disease who have undergone a course of sanatorium treatment, even for three or four months, fare appreciably better in later years than those that have not received such treatment. Figures are given to prove this. In the age group, 15 to 25 years, of the positive cases, sanatorium treatment, merely regarded from the point of prolongation of life, is very little better than home treatment. The definite educational value to the patient, his family, and friends must not be forgotten. *Conclusions:* 1. Given reasonably early cases for treatment and a capable medical superintendent, sanatorium treatment is justified by its results. 2. At the sanatorium attention should be given to the patient's mental state; purposeful work should be carried out, and healthy amusement and recreation furnished. 3. The attempts made generally throughout the country to train patients in new occupations, at special vocational training centres, have not been attended with success, and careful consideration should be given to the merging of training centres in or with the sanatorium, or converting them into sanatoria. 4. The accommodation for the treatment of adults and children suffering from nonpulmonary tuberculosis is insufficient for present day needs, and schemes for providing additional beds should be proceeded with. The number required, about one bed per 5,000 of the population, could be reduced by prevention of bovine infection. 5. Hospital accommodation for the combined cases of pulmonary and nonpulmonary tuberculosis is almost nonexistent in the country.—*The Present Position of Institutional Treatment, G. L. Cox, Brit. J. Tuberc., January, 1925, xix, 27.*—(*B. T. McM.*)

Annual Review of German Sanatoria, 1922.—There were only 41 sanatoria that contributed to the annual report of 1922, 16 more than for the year 1921. In all, 26,376 concluded treatments were reported (13,053 men, 9,751 women, 3,572 children). The material was markedly variable. Thirty-three per cent of the children were nontuberculous. The rarity of genuine tertiary tuberculosis during childhood is in contrast to the primary stage of pulmonary tuberculosis (30 per cent of all pulmonary tuberculosis cases). The percentage of bronchial-node tuberculosis was reduced about 7.6. Laryngeal tuberculosis, as a complication of pulmonary disease, increased in the women over that of the men, which is believed to be an error of observation. In 11 of the sanatoria pneumothorax treatment was not used. Twenty-five per cent of the tuberculosis cases were treated with tuberculin preparations. Heliotherapy of pulmonary tuberculosis was not used to a great extent, artificial raying being more frequently employed. Very good results were obtained with artificial sunlight treatment.—*Jahresbericht deutscher Lungenheilanstalten 1922, H. Ulrici, Beitr. z. Klin. d. Tuberk., 1924, lvii, 332.*—(*H. J. C.*)

Results of Sanatorium Treatment.—The present condition of 5,915 patients discharged from the Trudeau Sanatorium from 1885 to 1922 is reported. These patients were classified upon admission as follows: minimal, 26 per cent; moderately advanced, 59 per cent; far advanced 9 per cent; suspected and nontuberculous, 7 per cent. Of these cases there were living after from one to thirty-nine years: 1,167 minimal, 77 per cent; 1,898 moderately advanced, 55 per cent; 153 far advanced, 30 per cent; and 403 suspected or nontuberculous cases, 92 per cent. The ages of these patients ranged from 11 to 62 years, with an average of 27.2. *Results: Minimal cases*; Of a total of 1,512 cases, 1,157 or 77 per cent are alive, and 195 or 12.9 per cent died of tuberculosis. Of these deaths, 52, or 27 per cent, occurred within two years and 95, or 49 per cent, within four years, showing that nearly one-half of the deaths from tuberculosis in the minimal cases occur within the first four years. At the end of six years, 122, or 63 per cent, of the total deaths from tuberculosis had occurred. *Moderately advanced cases:* Of a total of 3,453 cases, 1,898, or 55 per cent, are alive, and 1,156, or 33 per cent, dead of tuberculosis, 548, or 47 per cent, within two years, and 784, or 68 per cent, within four years. At the end of six years 905, or 78 per cent, of the total deaths from tuberculosis had occurred. *Far advanced cases:* Of a total of 513 cases, 153, or 30 per cent, are alive, and 290, or 57 per cent, dead of tuberculosis. Of these latter, 218, or 75 per cent, died within two years, and 245, or 84 per cent, within four years. Within six years 260, or 90 per cent, of all deaths from tuberculosis had occurred. *Sus-*

pected or nontuberculous cases: Of 437 cases, 403, or 92 per cent, are alive. At the end of two years tuberculosis caused death about fourteen times as often in far-advanced and about five times as often in moderately advanced as in minimal cases. At the end of four years the respective ratio is about eight, four, one; and at the end of six years, six, three, one. This shows a gradual tendency toward equalization as the years advance, and a weeding out of the nonresisting or severely infected individuals. Of those dying of tuberculosis in each group, during the first two years, about one-quarter of the deaths had occurred in the minimal, one-half in the moderately advanced, and three-quarters in the far-advanced groups. Within four years, about one-half of the deaths from tuberculosis occurred in the minimal, about two-thirds in the moderately advanced, and four-fifths in the far advanced cases. After six years the figures are: minimal, about three-fifths; moderately advanced, three-quarters; far advanced cases, nine-tenths. This shows that when death from tuberculosis occurs it is very likely to happen within two years for the far advanced, within four years in the moder ately advanced, and within six years in the minimal cases. Tables and a brief list of diagnostic criteria accompany the article.—*The Present Condition of Patients Discharged from the Trudeau Sanatorium, F. H. Heise and L. Brown, Tubercle, February, 1925, vi, 227.—(J. S. W.)*

Climate of Chilean-Bolivian Highlands for Tuberculosis.—Tuberculosis, especially of the bones, is rarely observed among the inhabitants of the Chilean-Bolivian highlands. Severe cases of pulmonary tuberculosis from Europe under these conditions become capable of work, and relatively cured. If they return to their former residence in European climate recurrences occur shortly. Other infectious diseases also do not spread in the Bolvian-Chilean highlands.—*Der Einfluss des chilenisch-bolivianischen Hochlandes auf die Entwicklung der Lungenkrankheiten und Lungentuberkulose, A. Hartwig, Beitr. z. Klin. d. Tuberk., 1924, lvii, 375.—(H. J. C.)*

Rehabilitation of Patients with Advanced Tuberculosis.—The failure to stamp out tuberculosis is well known, as is also the failure to find a specific cure for existing cases. After many years the profession has learned that the educational campaign must be directed to the infant in arms and to the training of the physician in the essentials of diagnosis. In the Southwest to-day 60 per cent of admissions to sanatoria are in the far-advanced stages, and these offer but a piteously low percentage of real arrests. Yet, to look wise and give a fatal prognosis is not the mission of practitioners of the healing art. Peters was at first inclined to keep these patients under sanatorium care as long as possible, and to allow very little exercise until economic conditions demanded it, when the results were disastrous. But as he observed patients, who came to him, having worked for years with advanced disease he became bolder and his results better. He does not wish to be misunderstood as advocating indiscriminate or even graduated exercise for all tuberculosis patients, as the rest cure must always come first, but he feels very strongly that it should not be continued indefinitely, and he finds most people glad of the opportunity to test themselves out. This should always be preceded by a sufficient period of observation of the patients at rest. The physical findings in the chest should not be given undue weight, the clinical symptoms of activity being much more important. After bed-rest comes meals in the dining room, then graduated walking, then more interesting forms of exercise, such as golf. It is attempted, before discharging a patient, to have him under observation for six months of normal life. It is true that this is often impossible to achieve, but with a careful selection success is more frequent than failure and the patient appreciates being rescued from a life of invalidism.—*Certain Types of Advanced Tuberculosis; an Economic Asset, L. S. Peters, Med. J. & Rec., January 7, 1925, cxxi, 29.—(A. P.)*

Protective Inoculation with Dead Tubercle Bacilli.—Langer's claims for the establishment of allergy by bacillary products embody a number of irregularities and erroneous conclusions. As to the setting up of immunity by the injection of dead bacilli, calves injected with dead bacilli and exposed to tuberculous surroundings are not protected for any length of time against disease and death. The relation between protective inoculation and immunity to tuberculosis is far from clear, but experimental work would seem to indicate that the chances of real immunity being established in this way are very slim.—*Tuberkuloseschutzimpfung mit abgetöteten Tuberkelbazillen, F. Klopstock, Klin. Wchnschr., January 15, 1925, iv, 118.—(H. S. W.)*

Combined Small-Pox and Tuberculosis Vaccination.—It has been generally assumed that active immunity in tuber-

culosis results solely from actual infection with living tubercle bacilli. Recent experiments have however shown that hypersensitiveness to tuberculin can be produced in animals and man by inoculation with dead tubercle bacilli. A parallelism has always been recognized between such hypersensitiveness and immunity. The majority of attempts to induce hypersensitiveness in children by injection of dead tubercle bacilli have not been successful. Moro holds that this is to be explained largely in the failure of the nonallergic tissues of the noninfected child to react properly to the inoculated dead bacilli. In order to insure active tissue reaction in the area in which the tubercle bacilli are injected, Moro inoculates cow-pox virus and heat-killed tubercle bacilli simultaneously in children not previously vaccinated and also not sensitive to tuberculin. The cow-pox vaccination takes in the usual manner and some months later sensitiveness to tuberculin develops. The latter appears to be strictly the result of the inoculation of the dead bacilli, as in the cases studied conditions were such that the possibility of spontaneous true infection could be ruled out. In his experience in the inoculation of dead tubercle bacilli in children without the small-pox virus has failed to produce tuberculin hypersensitiveness. The sensitiveness developed by the combined administration appears to be true tuberculin allergy, not merely anaphylactic sensitization to tubercle-bacillus protein. The possible objection that skin sensitization does not necessarily mean general sensitiveness of the viscera is met by the argument that skin infection, as has many times been shown by Hamburger, Roemer and others, leads to general tissue immunity. The question is next raised, What degree of immunity can one expect to obtain by this method? Certainly no higher grade can be expected than occurs as a result of natural infection, that is, sufficient to protect against moderate but not massive superinfection. The allergy produced by the injection of dead bacilli is transient. It appears much decreased after 1 year. However, it can be restored by reinoculation. The study is still in the experimental stage. The correct vaccinating dosage is still to be worked out.—*Ueber Versuche, dem Säugling mittels eines kombinierten Vakzinationsverfahrens aktiven Tuberkuloseschutz zu verleihen, E. Moro, München. med. Wchnschr., January 30, 1925, lxxii, 172.*—(*E. R. L.*)

Antituberculosis Vaccination of Newborn.—Many inquiries have been received by the *Presse Médicale* about procuring Calmette's *BCG*, and it, therefore, publishes a letter from Calmette himself. He states that he believes it would be premature at present to recommend the general prophylactic employment of the vaccine by the profession at large. One must await a careful statistical comparison of the mortality in vaccinated and unvaccinated infants before drawing conclusions. However, it is desired to have his work controlled and confirmed by both clinicians and microbiologists, and the Institut Pasteur has organized a service for the preparation of *BCG* and will furnish sufficient amounts of it for the use of physicians who request it. They are asked, however, to use it only under the conditions mentioned, namely, exclusively in the first ten days after birth, by the buccal route, mixed with a little boiled milk and fed by a little spoon, in three doses, on alternate days, a half-hour before nursing. *BCG*, being constituted of living avirulent bacilli, must be freshly prepared, and will not keep over ten days. Collaborators using the vaccine are asked to make a report every six months if possible as to whether the child shows any evidence of infection and in what way it has been exposed. It is especially children of bacilliferous mothers, or in contaminated surroundings, in whom Calmette is interested. —*A propos de la vaccination antituberculeuse des nouveau-nés, A. Calmette, Presse Méd., August 27, 1924. no. 69, 1447.*—(*A. P.*)

Prophylaxis of Measles in Tuberculous Children.—The prophylaxis by means of serum from measles convalescents proved highly satisfactory in a sanatorium for tuberculous children. Four to 5 cc. of serum were used in each case. Only 3 cases, receiving only 3 cc. on account of serum shortage, developed typical but mild measles. The widespread use of measles prophylaxis, according to Degkwitz, is urged, but it is especially desired for tuberculous children.—*Die Maseruprophylaxe nach Degkwitz. Ein Beitrag zur Frage ihrer Brauchbarkeit zum Schutze tuberkulöser Kinder, O. Wiese, Beitr. z. Klin. d. Tuberk., 1923, lvii, 136.*—(*H. J. C.*)

Diagnosis of Bronchial Dilatation.—Bronchial dilatation may be very difficult to recognize clinically. Roentgenographic examination after lipoidal injection offers a precise and accurate method of diagnosis. This is of more than theoretical importance, as shown by the two case histories given. One was a women of 25 and the other a girl of 12. Both were for several years considered tuberculous. The first patient came under observation, suffering from marked hemoptysis of daily occurrence over a period

of a month, with dry cough and dyspnea. There was no fever. Clinical examination showed only signs of a well marked diffuse bilateral bronchitis. After three days' treatment with pituitary extract the hemoptysis ceased, and the only constant physical signs were impaired resonance over the middle of the left lung, cavernous breathing, bronchophony, pectoriloquy, and some coarse intermittent râles. Following this hemoptysis the patient began for the first time to raise large quantities of purulent expectoration. Bacteriological examination and animal inoculation were negative. X-ray plates did show a definite lesion. After lipoidol injection it was easy to diagnose bronchial dilataton on the roentgenograms. In the second case, the patient, a girl of 16, was treated for tuberculosis since 1920, and had spent four years in sanatoria. The diagnosis was maintained in spite of persistently negative sputum. The true diagnosis of bronchial dilatation was made only after lipoidol injection. *Technique:* The patients receive, some minutes before the examination, 0.5 cgm. of morphine. Under direct laryngoscopic control lipoidol is instilled through the glottis, after careful anesthetization of the pharynx and tongue, by a cocaine tampon and injecting a few drops of cocaine into the epiglottis. The lipoidal, heated to 37°, is injected directly into the trachea with an ordinary intratracheal syringe, and immediately roentgenograms are taken in the erect and recumbent positions. In cases of apical cavitation the patient is placed in an inclined position, and on the side to be injected, with head low. Accidents have never occurred. The lipoidol is eliminated in very small amounts from the air passages on coughing. The main bulk is slowly absorbed. The lipoidol apparently exerts a beneficial influence on the disease.—*Contribution à l'étude du diagnostic des dilatations des bronches par l'exploration radiologique après lipoidol, P. Nicaud and M. A. Dollfus, Presse Méd., October 15, 1924, no. 83, 817.*—(*B. T. McM.*)

Bronchiectasis Cured by Phrenicotomy.—A boy, aged 15, developed a frank pneumonia of the right base, following which a subfebrile condition persisted with cough and expectoration. The diagnosis lay between postpneumonic pleurisy and pulmonary scleroris with beginning bronchiectasis. Thoracotomy showed the pleura to be healthy, but the right base was indurated and carnified. At this time the classical syndrome of bronchiectasis developed. Artificial pneumothorax was induced, but it was incomplete owing to a dense adhesion preventing collapse of the lower lobe. Nevertheless, there was some improvement, hemoptyses ceased, and the general condition improved, but abundant expectoration and febrile exacerbations persisted, so much so that pneumonolysis was tried. Adhesions to the diaphragm prevented the separation of the base of the lung. Finally, phrenicotomy was done which, after a period of very copious expectoration, was followed by a rapid amelioration of symptoms. All the symptoms disappeared, including the clubbed fingers; the general condition was transformed and the patient was able to lead a normal life.—*Dilatation des bronches guérie par la phrénicotomie, E. Rist, meeting, Académie des Sciences, November 17, 1924, reported in Presse Méd., December 3, 1924, no. 97, 965.*—(*B. T. McM.*)

Bronchial and Intestinal Spirochetosis.—The presence in the sputum of a considerable number of spirochetes is undoubtedly abnormal, especially so as fortuitous contamination from the mouth and pharnyx is not a frequent source of error as it is in the feces. Moreover, intestinal spirochetes are normally found in the colon, whereas bronchial spirochetes are always pathogenic. There is a tropical bronchospirochetosis, a cosmopolite form and a latent form associated with tuberculosis. The diagnosis rests on the triad, spirochetes, hemoptyses, and sonorous râles. Predisposing factors are influenza, tuberculosis, syphilis, pyorrhea alveolaris, and buccal cancer, for the bronchial form, just as in the intestinal form cholera, amebiasis, cancer, tuberculosis and syphilis play a similar rôle. Experimentally the spiral organisms of the bronchi are pathogenic for the ape, but harmless for the rabbit and generally for the guinea pig, with the exception of the tonsillar variety of Vincent's spirochete. It is difficult to differentiate the various types of spirochetes, except the Treponema pallidum, which can be distinguished by inoculation into the rabbits' eye or testicle. The assumption of pathogenicity rests chiefly on the synchronism between the development of spirochetes and of symptoms, and their disappearance. The location of the foci is very diverse,—nasal, laryngeal, bronchial, alveolar, pleural, appendicular, cecal, colic, sigmoidorectal, etc. Only the alveolar and appendicular forms seem to penetrate to the blood stream and set up a general spirochetosis. Such secondary spirochetemias seem to result more in cerebral metastases than in hematemias, as is the case with *S. icterohemorrhagica.* The tissue reactions are congestion, hemorrhage and necrosis. The more superficial forms are never fatal in themselves. Symptomatically, there is great

polymorphism. The well-known retrosternal pain is only a common enough symptom of tracheitis. The typical bloody sputum may be lacking. Tracheobronchial localization is most frequent, and a hemorrhagic tracheobronchitis and a gangrenous bronchopneumonia are the commonest of the respiratory manifestations, just as a relapsing colitis and postdysenteric rectitis are the commonest intestinal manifestations. The physical signs of extension to the smaller air passages are those of congestion and pulmonary condensation, and in these forms pneumococcus infections or tuberculosis are almost always present, adding their own special symptoms. The latent forms, at times give no physical signs, but a persistent bronchitis with sputum containing many spirochetes should arouse suspicion, just as should loose or mucous stools full of spirochetes. They should not, of course, be allowed to mask the discovery of tubercle bacilli or amebae, but when these other organisms are repeatedly absent one may incriminate the spirochetes and administer specific chemotherapy, often with very favorable results. The diagnosis of primary spirochetosis, however, required the elimination of other factors.—*Quelques conditions de l'exploitation sémiotique des spirochétoses bronchiques et intestinales, M. G. Delamare, Progrès Méd., October 4, 1924, 40, 585.*—(*A. P.*)

Bronchopulmonary Spirochetosis.—Bronchopulmonary spirochetosis is not a tropical disease, as was once thought, but one which can be met with in different climates. It is provoked by the localization in the respiratory tract of a spirochete termed the *spirochete of Castellani.* In acute cases there is fever, headache, stiffness in the back and limbs, dry coughing, and sometimes hoarseness and retrosternal pain. Examination of the chest shows signs of bronchitis with different sibilant and sometimes, in some areas, subcrepitating râles; sometimes, also slight dulness at a summit or base. The expectoration is mucous at the beginning, then mucopurulent, often with streaks of blood. Sometimes the sputum is completely bloody, and real hemoptysis has also been met with. The acute cases, considered as very contagious, have generally an incubation period of one to three days. The fever remains during four or five days at about 39°C., then the symptoms improve little by little, and cure ensues. In certain cases the disease prolongs itself for five or six weeks, and cases have been described with many relapses and a tendency to become chronic. Two cases are described, and the literature is reviewed. The spirochete of Castellani displays a polymorphism that is considered characteristic. Forms can be seen, long or short, slender or thick, and they are found sometimes matted together. Their mobility is great, and they have sometimes the appearance of a vibrating cord, sometimes of an eel undulating slowly through obstacles. Their length varies from 0.2 to 0.3 micron. Their cultivation is difficult, and until lately was considered impossible. However, certain authors have recently reported success. The diagnosis is established by the presence of polymorphous spirochetes in the sputum. These are readily recognized by the ultramicroscope, or rather by microscopic examination on a black background. As a curative treatment neosalvarsan has, according to the majority of authors, given definite results. *Conclusions:* 1. There exists a bronchospirochetosis, chronic from the first and not contagious. 2. The fusospirillary organisms of Vincent may localize themselves in the bronchi and provoke bronchitis of the Castellani type. 3. There exist intermediate forms between the fusiform bacillus and the spirochete of Vincent, and the hypothesis that the fusiform bacillus is but an encysted form of the spirochete is a reasonable one. 4. The spirochete of Castellani may influence in the positive sense the Wassermann reaction. 5. Pyorrhea alveolaris seems to be the first localization of the various spirochetes, which on reaching the bronchi may give rise to bronchospirochetosis of Castellani. 6. Neosalvarsan in intravenous injections and with sufficient doses is the effective remedy for this spirochetosis.—*Bronchopulmonary Spirochetosis, Y. Schwartz, Lancet, December 27, 1925, ccvii, 1331.*—(*B. T. McM.*)

Saccharomycosis Simulating Tuberculosis.—The patient was ill for five months with abdominal and pulmonary symptoms and progressive cachexia. Tubercle bacilli were never demonstrated in the sputum but a saccharomyces was constantly and easily found in the sputum, vomited matter and feces. At autopsy there were nodules simulating a tumor in the peritoneum. In the lungs there were tubercles, occasionally conglomerate and forming abscesses. Histological examination eliminated cancer. The nodules had a tubercle-like structure with giant cells. There were no tubercle bacilli in the sections; fungi were easily recognizable, although altered —*Pseudo-tuberculose pulmonaire et péritonéale; présence d'un saccharomyces; absence de bacilles de Koch, Boidin and Potron, Meeting, Soc. Méd. d. Hôp. d. Paris, November 24, 1924, reported in Presse Méd., December 3, 1924, no. 97, 965.*—(*B. T. McM.*)

Artificial Pneumonokoniosis Produced Intravenously.—The author succeeded in producing artificial pneumonokoniosis in rabbits by repeated intravenous injections of a suspension of carbon in oil. A method of changing an acute progressive disease to a more chronic, mild form is bound to have a beneficial effect, and the therapeutic possibilities of the oil-carbon injections are pointed out, although its practical use is not recommended at present on account of the danger of oil embolism. It is also believed that inhibitory insoluble chemical substances, such as pulverized metals, may be utilized in this way.—*Künstliche Staublunge auf intravenösem Wege, N. Róna, Beitr. z. Klin. d. Tuberk., 1924, lvii, 327.*—(*H. J. C.*)

Pneumonokoniosis among Porcelain Workers.—The relation between dust inhalation and pulmonary tuberculosis was studied. While coal and the more dangerous stone dust, to which the miner is exposed, produce well defined anatomical and roentgenological disease as a result of the hard, sharp edges, making a more favorable soil for a progressive tuberculosis, the soft amorphous kaolin, imbedded lime and quartz particles of porcelain dust, in spite of years of exposure and heavy deposit in the lungs, do not produce such injury and changes. The tuberculosis morbidity in porcelain workers is low,—about 6 per cent. Progressive tuberculous processes were as a whole not found among the porcelain workers. As a result of this the theory, that pulmonary tuberculosis is an industrial disease of the porcelain worker and that tuberculous infection takes an unfavorable course in workers in this industry is opposed. Recommendations for protection are discussed.—*Beiträge zur Frage der Pneumokoniose, W. May and T. Petri, Beitr. z. Klin. d. Tuberk., 1924, lviii, 168.*—(*H. J. C.*)

Organic Dusts and Pneumonokoniosis.—It was formerly believed that the inhalation of all dusts was injurious to the respiratory tract and that exposure to all dusts was commonly followed by pulmonary tuberculosis. More recently it has been found that it is only the inorganic dusts that predispose to tuberculosis and that (a still debatable proposition) certain inorganic dusts, as coal, are protective against the development of this disease. There is no proof that organic dusts are harmful. Much of the appearance of damage from organic dusts comes, in reality, from a large amount of silica or other inorganic dust present in the dust that is predominantly organic. The study of morbidity or mortality rates of persons in supposedly dusty occupations is an entirely inadequate proof that the dust is at fault. No evidence of pathological damage to the respiratory tract from the inhalation of organic dusts has been brought forward, although there is ample evidence, both radiological and pathological, of damage induced by inorganic-dust inhalation. Autopsy records of 50 persons employed for varying lengths of time as weavers, spinners, knitters, etc., in textile works show nothing in the lungs that might be at all comparable to results that follow exposure to inorganic dust. The causes of death in these 50 persons were as follows: carcinoma 10, cardiovascular disease 10, renal disease 7, apoplexy 4, lobar pneumonia 4, pulmonary tuberculosis 4, organic nervous disease 4, intestinal obstruction 1, laryngeal stenosis 1, typhoid fever 1, erysipelas 1, alcoholism 1, gas poisoning 1, edema of the lungs 1. Organic dusts at times produce such protein intoxications as asthma, thresher's fever, etc., and may possibly be carriers of bacteria (this latter yet to be proved), but they emphatically do not produce pneumonokoniosis. On the other hand, potters, working in inorganic dusts, suffer more severely from the results of their exposure after the age of forty, and there are but few potters living at the age of sixty. They become ill or die from pneumonokoniosis or from tuberculosis superimposed upon it.—*The Relation of Organic Dust to Pneumonokoniosis, H. R. M. Landis, J. Industr. Hyg., January, 1925, vii, 1.* —(*H. S. W.*)

Primary Carcinoma of Lung.—Because of the similarity, from the clinical point of view, of primary lung cancer with any chronic pulmonary affection, and more especially to chronic tuberculosis, a good number of these patients used to be, and are still, directed to tuberculosis sanatoria. The increase in reports of lung tumors in the last decade is attributed to more careful attention to the disease. Three elements in the lungs may give rise to a primary carcinoma; namely, the epithelium lining the bronchial mucosa; the mucous glands; the epithelium lining the alveoli. The chief etiological factor of carcinoma of the lungs, according to Ewing, is tuberculosis. Both tuberculosis and cancer may exist, not only in the same subject but also in the same organ, whether lungs, mammary gland or uterus. Primary lung cancer is practically always preceded by a chronic inflammatory process. Tuberculosis, as a chronic inflammation, may account for the origin of a carcinoma leading to metaplasia of the epithelium (wall of a cavity, scar of a healed lesion), which is ultimately transformed into

malignancy. An etiological relationship may exist between acute inflammation of the lungs (epidemic influenza) and malignant tumor. Ten case histories with autopsy findings and illustrations are presented. In all but four of the cases metastases to the brain and bones were found. The usual order of frequency of metastases is regional lymph nodes, liver, pleura, lungs, brain, and bones. The patient's chief complaint often refers to symptoms caused by the metastases. Clinically, primary lung carcinoma is classified (Adler, Osler) as (1) an acute galloping pleuropneumonic form, lasting four to six weeks, and (2) a chronic pleuropulmonary carcinoma which includes the bronchopulmonary type, the mediastinal type and the pleuritic type. The clinical features may be typical, with the chief complaint concerning the thoracic organs, and atypical, with symptoms due to metastatic involvement. The difficulties in the diagnosis of the atypical cases, and they are apparently commonest, are often insurmountable. In the typical cases the onset is, as a rule, gradual. Auscultatory signs, even in advanced cases, may be scant and not characteristic. A cough, productive of a mucous or mucopurulent sputum intimately mixed or only streaked with blood, is one of the earliest complaints that usually leads to a diagnosis of tuberculosis. Hemoptysis, which is not rare at the onset of the disease, strengthens the diagnosis of phthisis. Pleurisy with a serous, purulent or, more often, bloody exudate, is not infrequent, but it is not pathognomonic. A sharp stabbing pain in the chest, due to early involvement of the pleura, is one of the most characteristic signs of carcinoma of the lungs. No other disease, and especially tuberculosis, will give such persistent pain with failure to respond to treatment. Cachexia is practically always present in cases running a typical course. Fever and night-sweats may be present. In the cases reported here the duration of the disease from the onset of the first symptoms varied from three months to about sixteen months. Primary carcinoma of the lung is more than twice as common in men as in women. The right side is by far the most often affected. A sputum, repeatedly negative for tubercle bacilli, in the presence of persistent lung symptoms (cough, pain in the chest, and blood streaked sputum), especially when in addition there has been a gradual downward course, always suggests malignant tumor. Repeated morphological examination of the fresh sputum should be done, but the presence of tumor cells has to be accepted with great caution. The pleural exudate is usually bloody, and not infrequently contains tumor cells. Here the fixation of the material will furnish more constant and reliable results. The fluid is centrifugated, and the sediment is fixed in 10 per cent formaldehyde or Zenker's fluid, and run through paraffin. A cancerous exudate is assumed by some to hemolyze red blood cells, as determined by centrifugating, but this is not always true. According to the literature the roentgenogram in malignant tumor of the lungs is typical at the onset of the disease *Conclusions:* Primary carcinoma of the lungs is apparently much more frequent than is commonly believed. Because of the similarity, from the clinical point of view, of primary lung cancer and a great many chronic lung affections, and particularly chronic pulmonary tuberculosis, primary malignant tumor of the lungs is often mistaken for phthisis or other lung disease. Primary carcinoma of the lungs possesses a vigorous metastatic power. From the cases here reported, it seems that the tumor metastasizes very early and that the bones and brain are apparently much more frequently involved than is generally recognized. The bones may be infiltrated with tumor without producing any change in the outward structure. Because of this property (early metastasis), the chief symptom of the patient, as well as the attention of the clinician, is concerned with the secondary involvement, while the primary lesion is often overlooked. In any case of chronic lung affection with an atypical course and persistence of symptoms, especially if tuberculosis is excluded, malignant tumor should always be considered. The presence of pulmonary tuberculosis does not exclude the coexistence of malignant tumor in the same organ.—*Primary Carcinoma of the Lungs, B. M. Fried, Arch. Int. Med., January, 1925, xxxv, 1.*—(*J. B. A.*)

Effects of Carcinoma of Bronchus.—As the neoplasm invades surrounding tissue and fills up the lumen of the bronchus, certain secondary effects are noted. When complete occlusion of the bronchus occurs there is collapse of the corresponding part of the lung because the air remaining in the alveoli is quickly absorbed by the circulating blood. When obstruction is incomplete the bronchi distal to it become dilated. Hence, in the gradually developing stenosis of a bronchial carcinoma, bronchiectasis with infection follows. As occlusion becomes more marked, atelectasis with its ensuing fibrous changes gradually complicates the picture. As a result of the atelectasis or of the infection or of both, there is a marked thickening of the pleura. This is sometimes accompanied or followed by an effusion which

may be limited by the pleural adhesions. Coincident with these changes, the patient's condition becomes worse and may vary greatly from day to day. Five case histories, with illustrations, are presented. *Summary and conclusions:* The object of this paper is to demonstrate the rather striking changes which may take place in the lung shadows during the course of primary bronchial carcinoma. These are of interest because the impression produced on the mind of the observer may be quite different at different times in the disease. A study of cases suggests that, as far as its physical effect is concerned, bronchial carcinoma may be considered as developing in two stages: (1) stage of invasion, and (2) stage of bronchostenosis which is characterized by bronchiectasis, infection, atelectasis and pleural thickening with or without fluid. The hazy ill-defined shadow about the hilum during the stage of invasion may be replaced, as the effects of bronchostenosis begin to manifest themselves, by a dense homogeneous shadow covering the area of one or more lobes, sometimes accompanied by displacement of the heart and trachea to the affected side. Such massive shadows are due to atelectasis of the corresponding lobes, with associated bronchial and pleural changes, and not to the tumor itself. Hence, it is evident that they are not characteristic of bronchial carcinoma but may be produced by any process which occludes a bronchus. Syphilitic stricture and pressure on a bronchus from an aneurysm or from tuberculous lymph nodes are other causes of bronchostenosis. It would seem that neoplastic bronchostenosis is distinctly more common. It is obvious that a correlation of clinical and laboratory information is necessary in order to reach a definite conclusion in these somewhat confusing cases. But when these shadows occupying the position of one or more lobes present themselves for consideration, if the possibility of bronchostenosis due to neoplasm is mentioned, the diagnostic machine will at least be started on the right road.—*The Effect of Bronchostenosis upon the Roentgen Ray Shadows in Carcinoma of the Bronchus, R. Golden, Am. J. Roentgenol. and Radium Therapy, January, 1925, xiii, 21.—(J. B. A.)*

Coexisting Syphilis and Cancer of Lung.—The patient, whose case is reported, was treated for eight months for syphilitic pachypleuritis. For three months signs of failing health existed, which, together with currant-jelly expectoration, suggested cancer of the lung. A large cavity, shown by X-ray, was the source of subsequent mucopurulent sputum. At autopsy a voluminous cancerous cavity was found, with mediastinal deposits which had invaded the right auricle. Histologically, the growth in the right lung proved to be an epidermoid epithelioma. Ulcerating syphilis of the lower lobe was also present.—*Syphilis pulmonaire et épithélioma primitif du poumon droit; volumineuse caverne cancéreuse; propagation au médiastin et à l'orielette droite. Rouslacroix and Blanc, Meeting, Comité Méd. des Bouchex-du-Rhone, December, 1924, reported in Presse Méd., January 21, 1925, no. 6, 89.—(J. B. A.)*

Nontherapeutic Pneumothorax.—There are two main groups of nontherapeutic pneumothorax connected with tuberculosis: (1) A group including the typical cases of chronic pneumothorax, hydropneumothorax and pyopneumothorax in tuberculous patients, mostly of bad prognosis; and (2) a group including most of the cases of so called "idiopathic" pneumothorax in apparently healthy persons, arising spontaneously or in connection with some slight muscular effort. The abnormal physical signs disappear within four or five days without special treatment. This is probably due to the rupture of a subpleural tubercle. It is possible for a patient dying from pulmonary tuberculosis to develop spontaneous dry pneumothorax of the same kind, which disappears completely in four or five weeks, even though death follows soon afterward owing to the severe progressive pulmonary tuberculosis. Nontherapeutic pneumothorax can hardly have a beneficial effect. In group 1 it generally becomes chronic and often hastens death. In group 2, without causing any harm, it does no good. It might conceivably, by some extraordinary combination of circumstances, occur over a tuberculous lung, the collapse of which would be beneficial; but in such a case the air would be spontaneously soon absorbed from the pleura, so that the pneumothorax would not last long enough to exert a therapeutic result, and an artificially maintained pneumothorax would be better.—*A Note on Nontherapeutic Pneumothorax Connected with Tuberculosis, F. P. Weber, Brit. J. Tuberc., January, 1925, xix, 41.—(B. T. McM.)*

Pulmonary Gangrene in Acute Tuberculosis.—This is a report of a man, sick for three weeks with a febrile malady with cough and anorexia. Pulmonary gangrene then developed suddenly and proved fatal in eight days. At autopsy the following lesions were found: massive gangrene with excavation of the upper lobe of the right lung; several small gangrenous cavities of the left lung; renal and pulmonary miliary tuberculosis. Pulmonary gangrene is a well-known com-

plication of chronic pulmonary tuberculosis. Its appearance in the course of an acute miliary tuberculosis is rare. Attention is drawn to the rapid evolution of this gangrene and to the enormous numbers of tubercle bacilli in the sputum.—*Gangrène pulmonaire à évolution rapidement mortelle au cours d'une tuberculose aiguë granulique, A. Lemierre and E. Bernard, Meeting, Soc. Méd. d. Hôp. de Paris, November 21, 1924, reported in Presse Méd., November 26 1924, no. 95, 941.*—(*B. T. McM.*)

Gangrene and Pulmonary Tuberculosis.—The first case reported was characterized by a torpid evolution, extending over several years, of a benign pulmonary phthisis, then the sudden and dramatic onset of malignant pulmonary gangrene with a fatal issue in twelve days. Autopsy showed a typical tuberculous cavity at the apex, and at the base a vast cavity with the classical features of gangrenous lesions. There also existed bronchopneumonic lesions and nodular tubercles. Clinically the picture of gangrene predominated. The second case showed a superficial bronchiectatic cavity and an unrecognized tuberculosis of very chronic nature, extending over ten years, and finally demonstrated by animal inoculation of the sputum.—*Gangrène et tuberculose pulmonaires, G. Caussade, A. Tardieu and G. Rosenthal, meeting, Soc. Méd. d. Hôp. d. Paris, November 14, 1924, reported in Presse Méd., November 19, 1924, no. 93, 920.*—(*A. P.*)

Gastric Disturbances in Pulmonary Tuberculosis.—There exist certain relations between pulmonary tuberculosis and gastric disturbances, the disturbances being of both secretory and motor types. In the initial stages, and in a large percentage of the chronic productive cases with a tendency toward fibrosis and healing, there is frequently hyperacidity, while in the exudative progressive cases subacidity and anacidity predominate. A frequent clinical symptom is chronic gastritis. There is also believed to be a certain relationship between pulmonary tuberculosis and gastric ulcer.—*Über Magenstörungen bei Lungentuberkulose, A. Ohly, Beitr. z. Klin. d. Tuberk., 1924, lviii, 206.*—(*H. J. C.*)

Pulmonary Tuberculosis and Intestinal Worms.—The presence of intestinal worms in the tuberculous was pointed out (40 per cent). The classical anthelmintic treatment is not used in these cases, in order not to upset the patients who appear little inconvenienced by their worms. Saturated camphor water is an agreeable, sufficiently active, anthelmintic.—*Tuberculose pulmonaire et vers intestinaux, Melamet, Meeting, Soc. d. Méd. de Paris, October 18, 1924, reported in Presse Méd., November 1, 1924, no. 88, 868.*—(*B. T. McM.*)

Relation of Psoriasis and Tuberculosis.—French authors consider *psoriasis vulgaris* as a tuberculous skin disease. In Germany this is disputed by dermatologists, but there are observations substantiating the relation. A case is reported, in which every artificial pneumothorax refill resulted in psoriasis vulgaris.—*Zur Frage des Zusammenhangs von Psoriasis und Tuberkulose, F. Junker, Beitr. z. Klin. d. Tuberk., 1923, lvii, 182.*—(*H. J. C.*)

Neuropsychiatry in Tuberculosis.—Functional nervous disease is so important that it can no longer be ignored in relation to a disease as chronic as tuberculosis. The abnormal psychological mechanisms observed in a large number of tuberculous patients, and the large number of psychoneurotics going through the hands of tuberculosis specialists, many eventually proving to be free from clinical tuberculosis, amply warrant more intensive study of this subject. The neurasthenic, the hysteric, the mild precox, can present symptoms considered characteristic of tuberculosis, and if they happen to have a familial tuberculous history they at once fall under strong suspicion. If, in addition, the chest reveals changes due to an old fibrotic lesion or an acute bronchitis they are likely to be treated as tuberculous and sent to sanatoria, sometimes with good results, but often to add another psychic trauma or complex, which later renders their proper treatment most difficult. There is little doubt that the necessary restraint and careful living, imposed upon the tuberculous in all stages, tend to bring about a chronic invalid reaction which persists, even to the extent of constituting a neurosis. Many of those patients who are beset with fears, worries and morbid ruminations need to be got out of bed or allowed more exercise. Some patients complain persistently of weakness and stick to their beds, even though their lung disease is quiescent or arrested. Others are incessantly restless and dissatisfied with their surroundings. Sex complexes may be present. These people require intensive suggestion, persuasion, and reëducation. In the normal person unfounded fears and apprehensions are readily removed by explanation but not so in the psychoneurotic. Many of these wander from place to place, seeking new scenes rather than expecting benefit. Of 200 patients studied, 47 per cent were suffering

from a definite psychosis or psychoneurosis, of which 55.5 per cent were hysteria, 27.3 per cent neurasthenia, 5.3 per cent precoxes, and 5.3 per cent constitutional psychopathic states. Among the most prominent symptoms met with were restlessness, insomnia, vague gastrointestinal symptoms, anxiety, instability, weakness, worry, palpitation, irritability and mental depression. Of 106 normal patients, 66 per cent made good progress; of the neuropsychiatric group, 21 per cent. Psychotherapy was employed in 48 patients, with favorable results in 27. This paper is a plea for men in tuberculosis work to familiarize themselves with neuropsychiatry. *Conclusions:* 1. Functional nervous disease occurs with great frequency among the tuberculous. 2. The disturbances in bodily function of a neuropsychiatric state can, no doubt, constitute a predisposing factor in tuberculosis. 3. Psychoneurotics are sometimes wrongly diagnosed as tuberculous, and find their way into institutions for tuberculosis. 4. It is a question how much of a rôle these patients play in the statistics from many tuberculosis institutions. 5. Proper psychiatric diagnosis and treatment are a definite help in treating such patients who also have tuberculosis. 6. The psychoneurotic has a definitely worse prognosis for his tuberculosis than the normal personality.—*Neuropsychiatry in Tuberculosis, R. J. Weigel, Med. J. & Rec., January 7, 1925, cxxi, 40.*—(*A. P.*)

Mikulicz's Disease with Tuberculosis.—A girl, aged 15 years, was admitted to the City of London Hospital with a diagnosis of early phthisis. Repeated physical examinations showed a chest apparently little removed from the normal. A radiogram of the chest was suggestive of miliary tuberculosis. A sputum examination showed tubercle bacilli present; subsequently, however, there were 7 successive negative examinations. The second point of interest about the case was that there were symmetrical enlargements of the parotid, submaxillary, and lachrymal glands. The swellings were smooth, uniform and not fixed. It was thought that the accessory lachrymal glands were palpable, but not the *socia parotidis*. The glands of Blandin-Nuhn were distinctly felt as two round hard swellings at the tip of the tongue. A diagnosis of Mikulicz's disease (simple lymphomatous hyperplasia of lachrymal and salivary glands) associated with arrested miliary tuberculosis covered the case.—*Mikulicz's Disease Associated with Arrested Miliary Tuberculosis, T. W. Preston and B. L. Jeaffreson, Brit. M. J., February 14, 1925, no. 3346, 304.*—(*B. T. McM.*)

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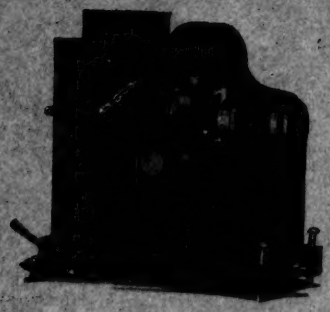

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